

WASHINGTON.

The following tables present the statistics of drainage for Washington collected at the census of 1920. The figures relate to conditions on January 1, 1920, except where indicated otherwise. No census of drainage has been taken heretofore, so there are no comparable figures for previous years. The data relate to the artificial drainage of land in farms, and of other land that ultimately will be used for agricultural purposes. The organized drainage enterprises include considerable areas of unimproved land not yet

in farms. The statistics for drainage on farms were collected in the general census of agriculture, while the statistics for drainage enterprises were obtained in a special canvass of those enterprises. Since drainage on farms may be either inside or outside an organized enterprise, and the drains that each individual owner installs upon his own farm may be either supplemental to or entirely independent of the works installed by an enterprise, the figures for the two parts of the drainage census are presented separately.

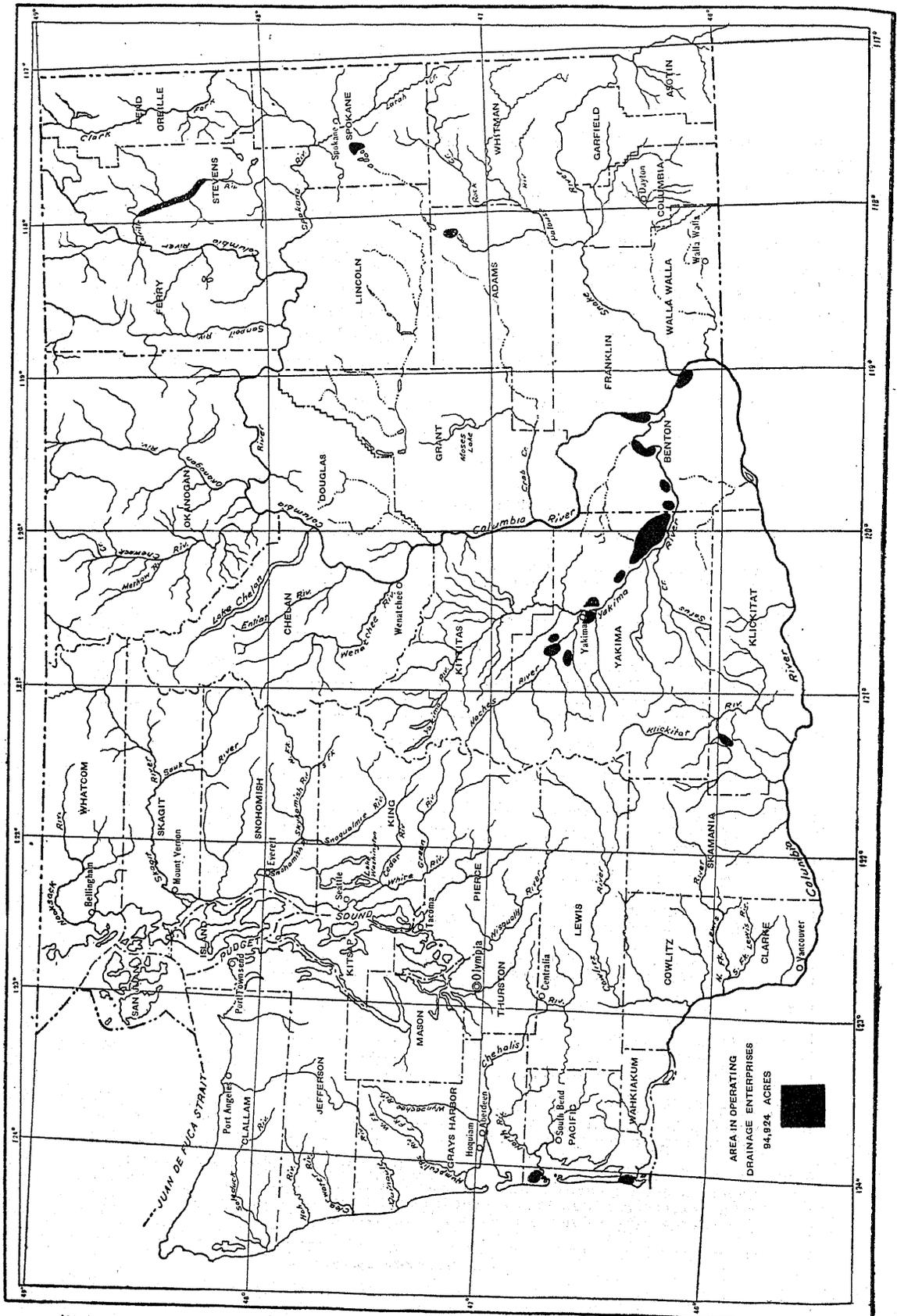
TABLE 1.—SUMMARY FOR THE STATE: 1920.

ITEM.	Amount.	Per cent of total.
DRAINAGE ON FARMS.		
Number of all farms in the state.....	66,288	100.0
Farms reporting land having drainage.....	10,020	15.1
Farms reporting land needing drainage.....	14,323	21.6
All land in farms..... acres..	13,244,720	100.0
Improved land in farms..... acres..	7,129,343	53.8
Farm land reported as provided with drainage..... acres..	274,696	2.1
Farm land reported as needing drainage..... acres..	576,005	4.3
Needing drainage only..... acres..	45,206	0.3
Needing drainage and clearing..... acres..	530,799	4.0
DRAINAGE ENTERPRISES.		
Approximate land area of the state..... acres..	42,775,040	100.0
All land in operating drainage enterprises..... acres..	94,924	0.2
Improved land..... acres..	81,836	0.2
Per cent of all improved land in farms.....	1.1	
Timber and cut-over land..... acres..	850	(1)
Other unimproved land..... acres..	12,188	(1)
Swampy, subject to overflow, seeped, or alkali..... acres..	10,873	(1)
Suffering a loss of crops from defective drainage..... acres..	8,996	(1)
Improved land prior to drainage..... acres..	49,748	0.1
Increase since drainage began..... acres..	32,138	0.1
Land in nonoperating enterprises..... acres..	4,865	(1)
Open ditches in operating enterprises..... miles..	169.8	100.0
Completed..... miles..	162.4	95.6
Additional under construction..... miles..	7.4	4.4
Tile drains in operating enterprises..... miles..	83.7	100.0
Completed..... miles..	83.0	99.2
Additional under construction..... miles..	0.7	0.8
Total capital invested in and required for completion of operating enterprises.....	\$1,436,419	100.0
Capital invested in these enterprises to Dec. 31, 1919.....	1,397,419	97.3
Additional capital required to complete these enterprises.....	39,000	2.7
Average cost per acre when completed.....	15.13

(1) Less than one-tenth of 1 per cent.

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APPROXIMATE LOCATION AND AREA OF OPERATING DRAINAGE ENTERPRISES.



Operating and nonoperating enterprises.—In most of the tables that follow, statistics are given for operating enterprises only. These include both those which have completed their drainage works and those with such works under construction. The nonoperating enterprises have a legal existence, though they have not yet accomplished any drainage. They may include districts that on the census date had completed their plans, sold bonds to finance the undertakings, and let contracts for the construction work, and also districts for which decree of establishment had just been issued and which were still subject to considerable change in area, plan of drainage works, and cost.

TABLE 2.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED AS BETWEEN OPERATING AND NONOPERATING ENTERPRISES: 1920.

CLASS.	LAND.		CAPITAL. ¹		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	99,789	100.0	\$1,442,419	100.0	\$114,000
Operating enterprises.....	94,924	95.1	1,397,419	96.9	39,000
With works completed.....	90,084	90.3	1,376,809	95.5	.....
With works under construction	4,840	4.8	20,610	1.4	39,000
Nonoperating enterprises.....	4,865	4.9	45,000	3.1	75,000

¹ The inquiry asked for the "total cost of the enterprise to Dec. 31, 1919," and for an "estimate of additional investment to complete."

Location of enterprises.—The great part of the drainage enterprises lies in the Yakima Valley, in the south central part of the state, though there are some enterprises to drain lands subject to overflow along Clark Fork and Colville River in the northeast corner and a very few to drain wet and swampy lands in the south and southwest parts of the state. There are no drainage enterprises in the region tributary to Puget Sound.

TABLE 3.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY DRAINAGE BASIN: 1920.

DRAINAGE BASIN.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises..	99,789	100.0	\$1,442,419	100.0	\$114,000
Operating enterprises.....	94,924	95.1	1,397,419	96.9	39,000
Pacific Ocean.....	4,200	4.2	37,044	2.6	10,000
Columbia River and Snake River.....	30,965	31.0	336,500	23.3	.....
Yakima River.....	59,759	59.9	1,023,875	71.0	29,000
Non operating enterprises.....	4,865	4.9	45,000	3.1	75,000
Yakima River.....	4,865	4.9	45,000	3.1	75,000

Condition of land in enterprises.—All the enterprises in Benton and Yakima Counties are within the boundaries of the United States Reclamation Service projects. They are for the drainage and protection of lands injured or threatened with seepage and the concentration of salts, commonly called alkali, in the surface soil as a result of irrigation.

In Benton County, 5,800 acres of irrigated land in drainage enterprises are reported as not having needed drainage, but as having been included and assessed merely as responsible for damage to the other lands.

The usual purpose of an organized enterprise is merely to provide adequate outlets into which the landowners of the district may drain their farms and to afford relief from overflows for the district as a unit. Therefore, the fact that an enterprise which has completed the construction of the drainage works authorized contains land still swampy, subject to overflow, seeped, or alkali, or land that suffers damage to crops, does not show that the improvement works are inadequate.

TABLE 4.—LAND IN ALL ENTERPRISES, CLASSIFIED BY CONDITION: 1920.

CONDITION OF LAND.	OPERATING ENTERPRISES.				Non-operating enterprises (acres).
	Total.		Works completed (acres).	Works under construction (acres).	
	Acreage.	Per cent of allland.			
All land in enterprises.....	94,924	100.0	90,084	4,840	4,865
Improved land.....	81,886	86.3	78,271	3,615	3,174
Timber and cut-over land.....	850	0.9	250	600	.....
Other unimproved land.....	12,188	12.8	11,563	625	1,691
Swampy, seeped, or alkali.....	10,873	11.5	9,743	1,130	1,416
Suffering a loss of crops.....	8,996	9.5	7,971	1,025	.....

Size of enterprises.—Presentation of the statistics by counties requires that an enterprise located in more than one county be divided, and the part in each county be considered a separate enterprise. In this way, 52 operating drainage enterprises are counted in Washington, with an average area of 2,029 acres assessed. Just 26 of them comprise between 1,000 and 5,000 acres each. The assessed acreage exceeds the land in enterprises by 10,553 acres, which is the amount of overlapping. The land in enterprises and the assessed acreage on each line of Table 5 refer to the same enterprises. From the total area of each enterprise, designated as the assessed area, the net amount of overlapping with enterprises organized previously was deducted, to determine the area to be tabulated as land in enterprise.

TABLE 5.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY SIZE OF AREA ASSESSED: 1920.

SIZE GROUP.	Land in enterprises (acres).	ASSESSED AREA.	
		Acreage.	Per cent of total.
All operating enterprises.....	94,924	105,477	100.0
Less than 200 acres.....	822	322	0.3
200 to 499 acres.....	6,830	1,625	1.5
500 to 999 acres.....	45,723	9,161	8.7
1,000 to 4,999 acres.....	19,649	52,320	50.1
5,000 to 9,999 acres.....	21,900	19,649	18.6
10,000 to 49,999 acres.....	21,900	21,900	20.8

Character of enterprises.—The drainage enterprises in Washington are known as drainage districts, diking and drainage districts, and drainage improvement districts, varying slightly in character but all organized under general drainage laws of the state.

Drainage districts are incorporated under an act of March 20, 1895 (ch. 115), and may comprise any portion of a county having five or more inhabitants or freeholders. They are established by the county commissioners upon petition from owners of a major part of the acreage and after favorable vote of the qualified voters residing in the proposed district. Each district must be conducive to the public health, convenience, and welfare; must increase the public revenue; must have sufficient outlet for drainage; and must cost less than the estimated benefits to be derived. A board of three elected drainage commissioners has exclusive charge of construction and maintenance for all drainage systems within the district. The cost of the enterprise is apportioned against the land in proportion to benefits. The plan of drainage and the assessments of benefits and damages to each landowner are prepared by the drainage commissioners and are submitted to the superior court of the county with petition that the works be constructed. After public hearing the benefits and damages are determined by jury, subject to appeal to the supreme court of the state. The district may issue bonds for 5 to 10 years upon petition from a majority of the landowners.

Diking and drainage districts, comprising portions of two or more counties and containing 100 or more inhabitants, are formed under an act of March 20, 1909 (ch. 225). Each is established by the state commissioner of public lands and the commissioners of the counties affected in joint meeting. The districts must be conducive to the public health, convenience, and welfare; must increase the public revenue; and must be of benefit to a majority of the land included. The petition for establishment must be signed by 100 freeholders in the proposed district or by a majority in each county when the total number is less than 200. The enterprise must be approved

in each county by vote of the qualified electors resident in the district. The cost of the undertaking is assessed against the land in proportion to the benefits that will be derived. A board of five elected district commissioners prepares the plan of drainage, makes the assessments, and secures construction of the works. Appeals regarding assessments may be taken to the superior court of the county and thence to the supreme court of the state. Bonds may be issued by the district for not exceeding 10 years.

The drainage improvement districts have been organized under acts of March 8, 1901 (ch. 66), and March 24, 1913 (ch. 176), when the landowners did not wish to incorporate as drainage districts or were too few. The later act repealed the earlier one. These districts are established by the county commissioners, who are the executive board for all such districts in the county. Petition for establishment may be made by one landowner, and the county engineer must report that the proposed work is feasible. The drainage plan, estimate of cost, and schedule of property that will be damaged are made by the county engineer, subject to modification by the commissioners at public hearing. If an award of damages is not acceptable to the landowner, condemnation proceedings are instituted. After the drainage works are constructed the cost is apportioned against all property benefited, including cities and irrigation systems, in proportion to the benefits. For a district in more than one county the petition is filed in each county; the engineers examine the project together, but report separately for their respective counties; the hearings are held and contracts are let by the boards of county commissioners acting jointly.

No enterprises were reported as diking districts, established under the act of 1895 (ch. 117), or as local improvement districts within irrigation districts under an act of 1917 (ch. 162). The diking districts, similar to drainage districts in method of organization, in 1907 were authorized to improve water courses flowing through or within the districts, and to construct all ditches necessary to protect the land or preserve the dikes. The local improvement districts may be established by the directors of the irrigation districts for drainage or other local improvements. A petition must be signed by the holders of title to one-fourth the acreage to be assessed. The enterprise will be managed by the directors of the irrigation district, and the cost assessed against the land in proportion to benefits.

Private drains may be established by the superior court of any county under an act of March 14, 1899 (ch. 125), when one landowner can not secure drainage except across the land of an objecting owner. After

investigation by the county surveyor and two other viewers, public hearing is held and the court awards damages which must be paid by the petitioners before beginning construction. An act of March 20, 1913 (ch. 133), provides that one owner may secure a private way of necessity across land of another by proceedings the same as for condemnation of private property by railroads.

The many amendments to the drainage laws enumerated, dealing with the details of procedure, powers of officials, extension and abandonment of drainage enterprises, are not mentioned herein and do not affect the types of organization as described above. All state, school, and granted lands are subject to assessment for drainage improvements like other lands.

Washington Territory was organized in 1854, and was admitted as a state in 1889. In 1858 a law was passed generally similar to that of 1899 for establishing private ditches. Acts of 1875 and 1883 were somewhat similar to the act of 1913 for drainage improvement districts. The first state legislature enacted a drainage law (approved Mar. 19, 1890) generally similar to that of 1913 authorizing drainage improvement districts. This was declared unconstitutional by the supreme court of the state in 1893 and 1894, as providing for taking private property without just compensation.

TABLE 6.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

CHARACTER OF ENTERPRISE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	99,789	100.0	\$1,442,419	100.0	\$114,000
Operating enterprises.....	94,924	95.1	1,397,419	96.9	39,000
Drainage districts.....	23,100	23.1	161,634	11.2	.....
Diking and drainage districts.....	5,000	5.0	48,500	3.4	.....
Drainage improvement districts.....	66,824	67.0	1,187,285	82.3	39,000
Law of 1901.....	31,991	32.1	342,194	23.7	.....
Law of 1913 ¹	34,833	34.9	845,091	58.6	39,000
Nonoperating enterprises.....	4,865	4.9	45,000	3.1	75,000
Drainage improvement districts.....	4,865	4.9	45,000	3.1	75,000

¹ Includes 1,100 acres under individual ownership.

Drainage works.—The total works completed by drainage enterprises to December 31, 1919, comprised 162.4 miles of open ditches and 83 miles of tile drains. The additional lengths under construction were 7.4 miles of open ditches, 0.7 mile of tile drains, and 1 mile of accessory levees. These figures do not include drains or levees installed by individual farm owners supplemental to the works of the enterprises, nor the works of flood-protection or levee districts that had not undertaken the construction of ditches or

tile drains. There are no pumping districts among the operating drainage enterprises in Washington, though there are 2,745 acres in nonoperating enterprises that will be drained, according to the plans, partly by gravity and partly by pumping.

TABLE 7.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY KIND OF DRAINAGE WORKS: 1920.

KIND OF WORKS.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All kinds.....	94,924	100.0	\$1,397,419	100.0	\$39,000
Open ditches only ¹	64,405	67.8	592,445	42.4	12,000
Open ditches and tile drains.....	25,147	26.5	612,659	43.8	27,000
Tile drains only.....	5,372	5.7	192,315	13.8	.....

¹ Includes 1,000 acres that will have open ditches and levees.

The average depth of the main or outlet ditch was reported for each enterprise. The maximum depth of outlet reported for any enterprise in the state and the maximum in each county are shown in line 15 of County Table II. The maximum length, width, and depth of outlet shown in that table for any county may not refer to the same enterprise.

In County Table II, line 16 shows the mean depth of branch ditches (open ditches only), which is a very crude indication of the depth of soil drainage that may be obtained in the enterprises as determined by the depth of outlet provided for farm drains. The mean depth was computed by giving each separate depth a weight in proportion to the acreage it serves. As most enterprises reported depths in whole numbers only, the occasional decimals were omitted in making these computations. Depths less than 3 feet were omitted; to include this group, computed as 3 feet, would show the mean depth for the state 5.3 instead of 5.4 feet.

TABLE 8.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY AVERAGE DEPTH OF BRANCH DITCHES: 1920.

DEPTH OF BRANCH DITCHES.	Acreage.	Per cent of total.
All operating enterprises.....	94,924	100.0
Less than 3 feet.....	553	0.6
3.0 to 3.9 feet.....	7,358	7.7
4.0 to 4.9 feet.....	9,263	9.8
5.0 to 5.9 feet.....	13,147	13.7
6.0 to 6.9 feet.....	28,523	24.9
7.0 to 7.9 feet.....	10,262	10.8
Not reporting branches.....	30,518	32.5

Maintenance of works.—The commissioners of the drainage districts are required by law to make an estimate each year of the expense for maintenance and repair of the drainage system during the succeeding year, which is assessed against the lands in the district in like proportion as the original assessment of

benefits. The commissioners of diking and drainage districts are required to levy an annual tax upon all the property in the district for maintenance of the improvement works, to be levied and collected in like manner as provided by law for levying and collecting school district taxes. The supervisors of drainage improvement districts must make annually an estimate of maintenance expenses, from which the county commissioners levy the assessment apportioned in the same manner as that to pay the cost of construction, though the basis of apportionment may be changed by the commissioners upon petition and after public hearing. The works of each local improvement district are kept in repair by the directors of the irrigation district the same as the irrigation works, but the expenses are paid from the operation and maintenance fund of that local improvement district, which is provided by special assessment against the lands in the local improvement district. No maintenance was reported for some completed districts established under laws requiring the officials to keep the drains in repair. Possibly this is due to the construction work being completed so recently that no expenses have been incurred for repair work.

TABLE 9.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY METHOD OF MAINTENANCE: 1920.

METHOD OF MAINTENANCE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All operating enterprises.....	94,924	100.0	\$1,397,419	100.0	\$39,000
By district forces.....	85,859	90.5	1,224,419	87.6	39,000
No maintenance provided ¹	9,065	9.5	173,000	12.4	.....

¹ Includes 1,100 acres maintained by landowners.

Date of organization.—The progress in drainage is shown only roughly by the dates of the organization of the enterprises, which are the dates when the districts were established by the county commissioners, since there may be a period of a year or more between the decree of establishment and the beginning of actual construction and since the work of construction may occupy several years in a large district. It was not practicable, however, for the census to secure data as to the time of the beginning or the completion of the drainage works. Under the date of organization are tabulated the entire area, works, and capital of each enterprise, even including extensions made after the original plan of reclamation was com-

pleted. No drainage enterprises were reported as organized in Washington earlier than 1900.

TABLE 10.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	LAND.		AREA ASSESSED.	
	Acreage.	Per cent of total.	Acreage.	Per cent of total.
All operating enterprises.....	94,924	100.0	105,477	100.0
1900 to 1904.....	3,200	3.4	3,200	3.0
1905 to 1909.....	39,966	42.1	39,966	37.9
1910 to 1914.....	30,761	32.4	35,304	33.5
1915 to 1919.....	14,497	15.3	20,507	19.4
Not reported.....	6,500	6.8	6,500	6.2

TABLE 11.—CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	CAPITAL.		
	To Dec. 31, 1919.		Additional required to complete.
	Amount.	Per cent of total.	
All operating enterprises.....	\$1,397,419	100.0	\$39,000
1900 to 1904.....	26,634	1.9	.....
1905 to 1909.....	352,850	25.2	.....
1910 to 1914.....	594,937	42.6	.....
1915 to 1919.....	382,988	27.4	39,000
Not reported.....	40,000	2.9	.....

TABLE 12.—DRAINS AND LEVEES (COMPLETED AND UNDER CONSTRUCTION) IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	DITCHES.		TILE.		LEVEES.	
	Miles.	Per cent of total.	Miles.	Per cent of total.	Miles.	Per cent of total.
1900 to 1904.....	4.5	2.7	.....	.....	.....	.....
1905 to 1909.....	65.8	38.8	6.0	7.2	.....	.....
1910 to 1914.....	63.5	40.3	38.9	46.5	.....	.....
1915 to 1919.....	26.0	15.3	38.8	46.3	1.0	100.0
Not reported.....	5.0	2.9	.....	.....	.....	.....

Crops.—The principal crops grown upon the drained land in drainage enterprises are alfalfa, hay other than alfalfa, and wheat. Data were not secured to show the part of each enterprise planted to any crop, so the enterprises have been classified according to the principal crop, and the total area of improved land is shown thus classified, in County Table II. No data were secured at the general census of agriculture to separate the crops grown upon land drained artificially from those produced upon land drained naturally.

DRAINAGE—WASHINGTON.

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COUNTY TABLE I.—DRAINAGE ON FARMS: 1920.

		THE STATE.	Adams.	Chelan.	Clallam.	Clarke.	Cowlitz.	Grant.	Grays Harbor.
1	Number of all farms in the state or county.....	66,288	1,084	2,095	607	3,066	1,066	1,110	1,064
2	Farms reporting land having drainage.....	10,020	2	42	167	275	89	6	93
3	Farms reporting land needing drainage.....	14,323	2	116	337	880	587	10	245
4	Farms in drainage and levee districts.....	2,680	4	11	2	26	56	1	5
LAND AND FARM AREA.									
5	Approximate land area of the state or county..... acres..	42,775,040	1,223,680	1,856,000	1,104,640	405,760	737,920	1,740,800	1,190,160
6	All land in farms..... acres..	13,244,720	938,395	235,621	58,043	194,309	110,259	743,518	94,767
7	Improved land in farms..... acres..	7,129,343	727,876	65,810	20,132	75,673	27,994	413,758	28,795
8	Woodland in farms..... acres..	1,813,061	2,243	55,817	29,776	66,974	48,604	6,305	43,402
9	Other unimproved land in farms..... acres..	4,302,316	208,276	113,994	8,135	51,662	35,661	323,455	22,567
10	Farm land reported as provided with drainage..... acres..	274,696	1,260	947	3,563	5,035	5,179	815	1,578
11	Farm land reported as needing drainage..... acres..	576,005	235	3,836	18,799	37,875	28,457	855	10,060
12	Drainage only..... acres..	45,206	105	348	1,838	2,065	2,320	550	1,344
13	Drainage and clearing..... acres..	530,799	130	3,488	16,961	35,810	26,137	305	8,716

		Island.	Jefferson.	King.	Kitsap.	Kittitas.	Klickitat.	Lewis.	Lincoln.
1	Number of all farms in the county.....	763	348	3,801	1,535	928	1,177	3,030	1,860
2	Farms reporting land having drainage.....	271	92	1,048	541	129	45	653	33
3	Farms reporting land needing drainage.....	296	118	1,156	612	196	89	1,261	38
4	Farms in drainage and levee districts.....	53	4	192	44	2	23	24	7
LAND AND FARM AREA.									
5	Approximate land area of the county..... acres..	133,120	1,155,200	1,351,040	237,440	1,490,560	1,168,000	1,516,160	1,473,280
6	All land in farms..... acres..	51,932	35,917	151,562	43,835	215,918	562,331	226,162	1,329,605
7	Improved land in farms..... acres..	17,127	8,457	68,272	13,411	95,984	190,616	79,322	832,478
8	Woodland in farms..... acres..	25,868	17,903	47,391	22,856	36,074	89,044	89,281	64,578
9	Other unimproved land in farms..... acres..	8,937	9,557	35,899	7,618	83,860	282,671	57,559	432,149
10	Farm land reported as provided with drainage..... acres..	6,791	3,218	20,177	3,259	4,027	3,950	16,838	1,805
11	Farm land reported as needing drainage..... acres..	11,183	10,728	29,206	8,547	10,274	5,141	54,323	2,519
12	Drainage only..... acres..	2,379	758	3,537	798	1,881	1,211	2,055	1,353
13	Drainage and clearing..... acres..	8,804	9,970	25,669	7,749	8,393	3,930	52,268	1,161

		Mason.	Okanogan.	Pacific.	Pend Oreille.	Pierce.	San Juan.	Skagit.	Snohomish.
1	Number of all farms in the county.....	483	2,856	453	586	3,159	535	2,401	3,095
2	Farms reporting land having drainage.....	115	43	131	75	948	209	849	945
3	Farms reporting land needing drainage.....	207	321	215	301	1,028	214	615	1,185
4	Farms in drainage and levee districts.....		2	54	34	142	1	513	240
LAND AND FARM AREA.									
5	Approximate land area of the county..... acres..	595,200	3,341,440	572,800	871,040	1,088,640	113,920	1,135,360	1,320,960
6	All land in farms..... acres..	40,867	689,796	48,804	119,496	118,754	68,513	136,350	151,584
7	Improved land in farms..... acres..	8,373	212,497	10,509	42,921	41,953	18,922	73,243	53,410
8	Woodland in farms..... acres..	22,946	113,747	19,058	59,103	40,328	30,859	38,769	53,727
9	Other unimproved land in farms..... acres..	9,548	363,552	19,237	17,472	36,473	18,732	24,338	44,447
10	Farm land reported as provided with drainage..... acres..	1,805	907	3,186	2,551	13,323	5,915	37,694	18,539
11	Farm land reported as needing drainage..... acres..	10,670	15,201	12,874	25,959	21,694	11,870	19,790	32,349
12	Drainage only..... acres..	504	906	1,627	1,255	2,272	987	2,177	2,625
13	Drainage and clearing..... acres..	10,166	14,295	11,247	24,704	19,422	10,903	17,613	29,724

		Spokane.	Stevens.	Thurston.	Wahkiakum.	Walla Walla.	Whatcom.	Yakima.	All other counties. ¹
1	Number of all farms in the county.....	4,830	2,727	1,490	373	1,502	3,369	5,755	9,140
2	Farms reporting land having drainage.....	295	194	194	128	39	990	1,330	49
3	Farms reporting land needing drainage.....	653	860	412	129	30	1,861	1,222	232
4	Farms in drainage and levee districts.....	30	45	68	86	17	109	875	10
LAND AND FARM AREA.									
5	Approximate land area of the county..... acres..	1,123,840	1,603,200	453,760	170,880	809,600	1,332,480	3,237,760	8,214,400
6	All land in farms..... acres..	811,206	472,490	140,040	33,209	703,251	177,742	479,629	4,060,965
7	Improved land in farms..... acres..	449,537	139,391	45,953	8,577	474,161	73,673	261,866	2,548,449
8	Woodland in farms..... acres..	207,468	245,844	48,438	16,294	14,120	56,595	15,224	186,425
9	Other unimproved land in farms..... acres..	154,201	87,255	45,649	8,338	214,970	47,474	202,539	1,326,091
10	Farm land reported as provided with drainage..... acres..	16,375	7,685	4,852	3,044	1,468	23,316	54,558	1,036
11	Farm land reported as needing drainage..... acres..	25,235	73,681	17,728	2,938	546	61,233	2,894	9,305
12	Drainage only..... acres..	1,689	1,307	2,163	412	251	2,998	912	594
13	Drainage and clearing..... acres..	23,546	72,374	15,565	2,526	295	58,235	1,982	8,711

¹No drainage reported in Asotin, Douglas, Franklin, Garfield, and Skamania Counties.

DRAINAGE—WASHINGTON.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920.

	THE STATE.	Benton.	Klickitat.	Pacific.	Stevens.	Yakima.	Other counties. ¹	
LAND AREA.								
1	Approximate land area of the state or county.....acres..	42,775,040	1,069,440	1,168,000	572,800	1,603,200	3,237,760	2,347,520
2	All land in operating drainage enterprises.....acres..	94,924	10,340	4,965	4,200	15,000	55,919	4,500
3	Improved land.....acres..	81,886	9,715	4,468	2,960	13,750	47,593	3,400
4	Per cent of all improved land in farms.....	1.1	4.8	2.3	28.2	9.9	18.2	0.3
5	Timber and cut-over land.....acres..	850			600			
6	Other unimproved land.....acres..	12,188	625	497	640	1,000	8,326	1,100
7	Swampy, seeped, or alkali, in enterprises.....acres..	10,873	914	497	640	1,000	7,222	600
8	Suffering a loss of crops from defective drainage.....acres..	8,996	725		600	938	6,733	
9	Assessed acreage.....	105,477	10,340	4,965	3,200	15,000	66,472	5,500
10	Excess over all land in operating enterprises.....acres..	10,553					10,553	
DRAINAGE WORKS.								
Open ditches:								
11	Completed.....miles..	162.4	7.9	12.0	4.5	26.0	86.5	25.5
12	Additional under construction.....miles..	7.4	3.9					3.5
13	Maximum completed in any enterprise.....miles..	18.0	3.0	12.0	4.5	18.0	13.9	11.0
14	Maximum width at bottom of ditch ².....feet..	40	6	30	10	40	5	14
15	Maximum of average depths of outlet ditches ².....feet..	10.0	7.0	8.0	3.5	9.0	10.0	10.0
16	Mean depth of branch ditches ².....feet..	5.4	4.5	6.0	3.0		5.6	3.8
Tile drains:								
17	Completed.....miles..	83.0					82.0	1.0
18	Additional under construction.....miles..	0.7	0.7					
19	Maximum completed in any enterprise.....miles..	14.1					14.1	1.0
20	Maximum size of tile ².....inches..	32					32	8
Accessory levees and dikes:								
21	Completed.....miles..							
22	Under construction.....miles..	1.0			1.0			
23	Area drained by open ditches only ².....acres..	* 64,405	7,890	4,965	* 4,200	15,000	28,950	3,400
24	Length of these ditches.....miles..	108.9	6.8	12.0	4.5	26.0	41.6	18.0
25	Average length per acre.....feet..	8.9	4.6	12.8	5.7	9.2	7.6	23.0
26	Length of the accessory levees.....miles..	1.0			1.0			
27	Area drained by tile only ².....acres..	5,372					5,372	
28	Length of these tile.....miles..	28.2					28.2	
29	Average length per acre.....feet..	27.7					27.7	
30	Area drained by both ditches and tile ².....acres..	25,147	2,450				21,597	1,100
31	Length of these drains.....miles..	116.4	5.7				88.7	12.0
32	Average length per acre.....feet..	24.4	12.3				24.1	57.6
DEVELOPMENT OF LAND.								
33	Improved land in operating enterprises, 1920.....acres..	81,886	9,715	4,468	2,960	13,750	47,593	3,400
34	Improved land prior to drainage.....acres..	49,748	9,715	497			39,536	
35	Increase since drainage.....acres..	32,138		3,971	2,960	13,750	8,057	3,400
36	Per cent of increase ⁴	64.6		799.0			20.4	
37	Per cent increase is of all improved land in farms, 1920.....	0.5		2.1	28.2	9.9	3.1	0.3
38	Timber and cut-over land, 1920.....acres..	850			600	250		
39	Timber and cut-over land prior to drainage.....acres..	1,500			1,000	500		
40	Decrease since drainage.....acres..	650			400	250		
41	Per cent of decrease.....	43.3			40.0	50.0		
42	Other unimproved land, 1920.....acres..	12,188	625	497	640	1,000	8,326	1,100
43	Other unimproved land prior to drainage.....acres..	43,676	625	4,468	3,200	14,500	16,383	4,500
44	Decrease since drainage.....acres..	31,488		3,971	2,560	13,500	8,057	3,400
45	Per cent of decrease.....	72.1		88.9	80.0	93.1	49.2	75.6
46	Swampy, seeped, or alkali, 1920.....acres..	10,873	914	497	640	1,000	7,222	600
47	Swampy, seeped, or alkali, prior to drainage.....acres..	38,871	2,803	4,468	3,200	9,000	16,500	2,900
48	Decrease since drainage.....acres..	27,998	1,889	3,971	2,560	8,000	9,278	2,300
49	Per cent of decrease.....	72.0	67.4	88.9	80.0	88.9	56.2	79.3
CAPITAL INVESTED AND COST PER ACRE.								
50	Total capital invested in and required for completion of operating enterprises.....dollars..	1,436,419	79,200	123,000	47,044	118,500	1,013,675	55,000
51	Capital invested in these enterprises to Dec. 31, 1919.....dollars..	1,397,419	50,200	123,000	37,044	118,500	1,013,675	55,000
52	Additional capital required to complete these enterprises.....dollars..	39,000	29,000		10,000			
53	Average cost per acre when completed.....dollars..	15.13	7.66	24.77	11.20	7.90	18.13	12.22
54	Enterprises constructing open ditches only.....dollars..	* 604,445	46,700	123,000	* 47,044	118,500	244,201	25,000
55	Average cost per acre when completed.....dollars..	9.39	5.92	* 24.77	11.20	7.90	8.44	7.35
56	Enterprises constructing tile drains only.....dollars..	192,315					192,315	
57	Average cost per acre when completed.....dollars..	35.80					35.80	
58	Enterprises constructing both open ditches and tile drains.....dollars..	639,659	32,500				577,159	30,000
59	Average cost per acre when completed.....dollars..	25.44	13.27				26.72	27.27
CROPS.								
Improved land in enterprises reporting—								
60	Alfalfa as principal crop on drained land.....acres..	52,418	4,825				47,593	
61	Hay (except alfalfa) as principal crop on drained land.....acres..	19,710			2,560	13,750		3,400
62	Wheat as principal crop on drained land.....acres..	4,468		4,468				
63	Not reporting principal crop on drained land.....acres..	5,290	4,890		400			

¹ Includes only Adams and Spokane Counties.
² When works under construction have been completed.
³ Includes 1,000 acres having open ditches and levees.

⁴ Per cent not shown when more than 1,000.
^{*} Includes cost of 1 mile of levees.

WISCONSIN.

The following pages present the statistics of drainage for Wisconsin collected at the census of 1920. The figures relate to conditions on January 1, 1920, except where indicated otherwise. No census of drainage has been taken heretofore, so there are no comparable figures for previous years. The data relate to the artificial drainage of land in farms and of other land that ultimately will be used for agricultural purposes. The organized drainage enterprises may include considerable areas of timbered and other unimproved

land not yet in farms. The statistics for drainage on farms were collected in the general census of agriculture, while the statistics for drainage enterprises were obtained in a special canvass of those enterprises. Since drainage on farms may be either inside or outside an organized enterprise, and the drains that each individual owner installs upon his own farm may be either supplemental to or entirely independent of the works installed by an enterprise, the figures for the two parts of the drainage census are presented separately.

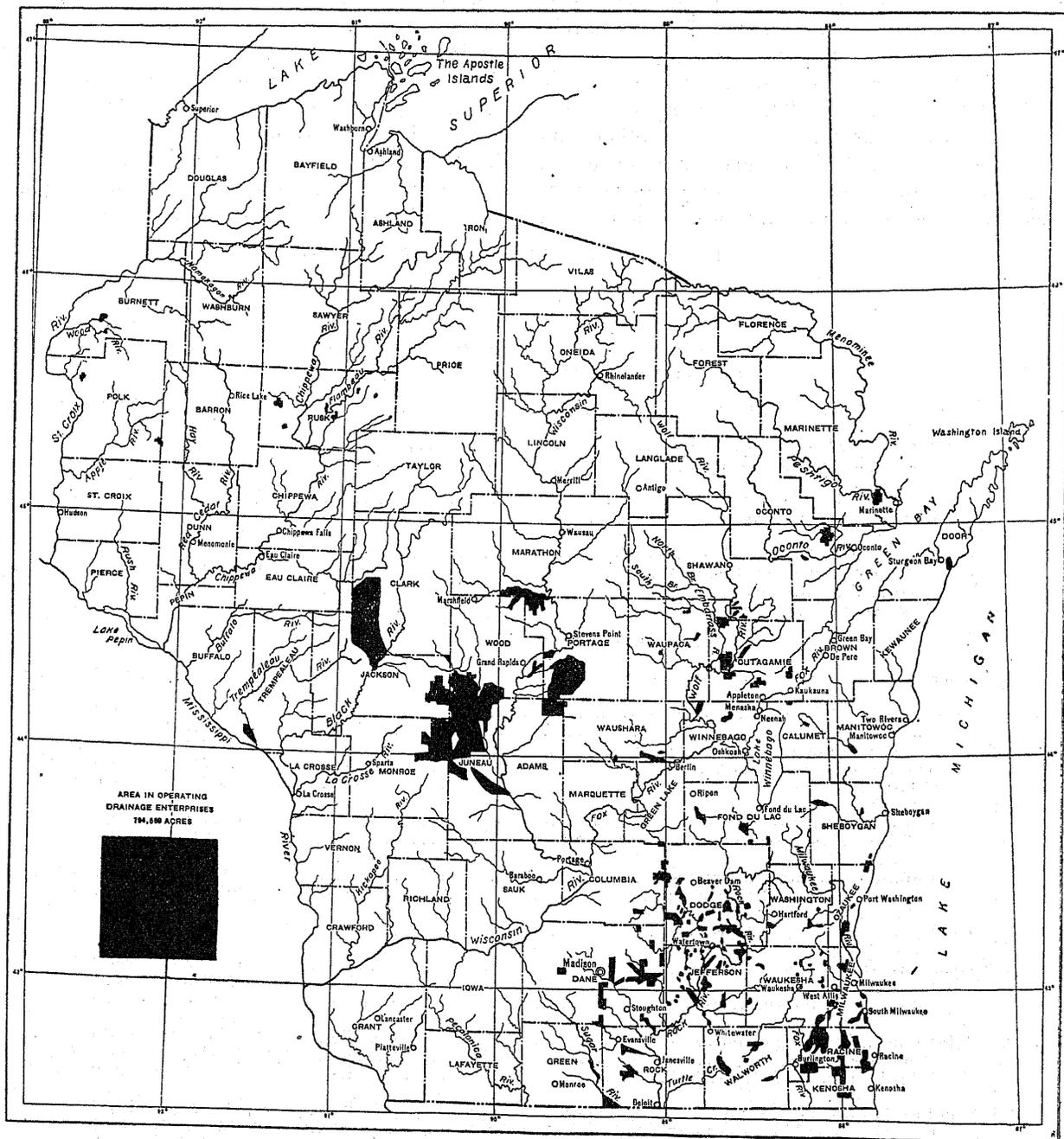
TABLE 1.—SUMMARY FOR THE STATE: 1920.

ITEM.	Amount.	Per cent of total.
DRAINAGE ON FARMS.		
Number of all farms in the state.....	189,295	100.0
Farms reporting land having drainage.....	21,838	11.5
Farms reporting land needing drainage.....	52,228	27.6
All land in farms..... acres..	22,148,223	100.0
Improved land in farms..... acres..	12,452,216	56.2
Farm land reported as provided with drainage..... acres..	658,411	3.0
Farm land reported as needing drainage..... acres..	1,839,273	8.3
Needing drainage only..... acres..	461,612	2.1
Needing drainage and clearing..... acres..	1,377,661	6.2
DRAINAGE ENTERPRISES.		
Approximate land area of the state..... acres..	35,363,840	100.0
All land in operating drainage enterprises..... acres..	794,569	2.2
Improved land..... acres..	254,504	0.7
Per cent of all improved land in farms.....	2.0	-----
Timber and cut-over land..... acres..	177,744	0.5
Other unimproved land..... acres..	362,321	1.0
Swampy, subject to overflow, seeped, or alkali..... acres..	130,111	0.4
Suffering a loss of crops from defective drainage..... acres..	9,848	(1)
Improved land prior to drainage..... acres..	50,071	0.1
Increase since drainage began..... acres..	204,433	0.6
Land in nonoperating enterprises..... acres..	19,000	0.1
Open ditches in operating enterprises..... miles..	1,779.3	100.0
Completed..... miles..	1,691.3	95.1
Additional under construction..... miles..	88.0	4.9
Tile drains in operating enterprises..... miles..	251.4	100.0
Completed..... miles..	211.3	84.0
Additional under construction..... miles..	40.1	16.0
Total capital invested in and required for completion of operating enterprises..	\$4,564,625	100.0
Capital invested in these enterprises to Dec. 31, 1919.....	4,163,055	91.2
Additional capital required to complete these enterprises.....	401,570	8.8
Average cost per acre when completed.....	5.74	-----

1 Less than one-tenth of 1 per cent

WISCONSIN

APPROXIMATE LOCATION AND AREA OF OPERATING DRAINAGE ENTERPRISES.



Operating and nonoperating enterprises.—In most of the tables that follow, statistics are given for operating enterprises only. These enterprises, as already defined, include both those which have completed their drainage works and those with such works under construction; among the latter may be some that had completed the original plan of reclamation several years ago but were constructing extensions or enlargements on January 1, 1920. The nonoperating enterprises have a legal existence, though they have not yet accomplished any drainage. They may include districts that on the census date had completed their plans, sold bonds to cover the cost of the undertakings, and let contracts for the construction work, and also districts that had just been established by decrees of the courts and were still subject to considerable change in area, plan of drainage works, and cost.

TABLE 2.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED AS BETWEEN OPERATING AND NONOPERATING ENTERPRISES: 1920.

CLASS.	LAND.		CAPITAL. ¹		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	813,569	100.0	\$4,168,055	100.0	\$512,570
Operating enterprises.....	794,569	97.7	4,163,055	99.9	401,570
With works completed.....	572,208	70.3	3,208,944	77.0	.....
With works under construction..	222,361	27.3	954,111	22.9	401,570
Nonoperating enterprises.....	19,000	2.3	5,000	0.1	111,000

¹ The inquiry asked for the "total cost of the enterprise to Dec. 31, 1919," and for an "estimate of additional investment to complete."

Location of enterprises.—More than 60 per cent of the acreage in operating drainage enterprises in Wisconsin is located in a group of seven counties near the center of the state, and most of the other land in such enterprises is in the southeastern counties. There are comparatively few operating enterprises in the northern third of the state and none in the southwestern corner.

TABLE 3.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY DRAINAGE BASIN: 1920.

DRAINAGE BASIN.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	813,569	100.0	\$4,168,055	100.0	\$512,570
Operating enterprises.....	794,569	97.7	4,163,055	99.9	401,570
Illinois River.....	57,351	7.0	331,130	9.1	.....
Rock River.....	110,814	13.6	667,670	16.0	43,000
Wisconsin River.....	370,016	45.5	1,914,833	45.9	37,000
Chippewa River.....	5,614	0.7	75,414	1.8	13,000
St. Croix River.....	5,080	0.6	23,673	0.6	.....
Mississippi River.....	138,037	17.0	219,500	5.3	115,000
Lake Michigan.....	107,657	13.2	880,830	21.1	192,970
Nonoperating enterprises.....	19,000	2.3	5,000	0.1	111,000
Rock River.....	5,000	0.6	1,500	.....	58,000
Wisconsin River.....	10,500	1.3	.....	.....	30,000
Lake Michigan.....	3,500	0.4	3,500	0.1	25,000

Condition of land in enterprises.—The drainage enterprises in Wisconsin have been organized in most part for the reclamation of swamp or marsh land or for the improvement of areas that were usually too wet for most profitable cultivation. The tracts generally are near or bordering the smaller streams of the state.

The usual purpose of an organized enterprise is merely to provide adequate outlets into which the landowners of the district may drain their farms, and to afford relief from overflow for the district as a unit. Therefore, the fact that an enterprise which has completed the construction of the drainage works authorized contains land still swampy or subject to overflow, or land that suffers damage to crops, does not show that the improvement works are inadequate.

TABLE 4.—LAND IN ALL ENTERPRISES, CLASSIFIED BY CONDITION: 1920.

CONDITION OF LAND.	OPERATING ENTERPRISES.				Nonoperating enterprises (acres).
	Total.		Works completed (acres).	Works under construction (acres).	
	Acreage.	Per cent of total.			
All land in enterprises.....	794,569	100.0	572,208	222,361	19,000
Improved land.....	254,504	32.0	220,908	33,596	280
Timber and cut-over land.....	177,744	22.4	84,280	93,464	3,325
Other unimproved land.....	362,321	45.6	267,020	95,301	15,395
Swampy or subject to overflow....	130,111	16.4	68,908	61,203	13,300
Suffering a loss of crops.....	9,848	1.2	9,774	74	.....

Size of enterprises.—Presentation of the statistics by counties requires that an enterprise located in more than one county be divided, and the part in each county be considered a separate enterprise. In this way, 290 operating drainage enterprises are counted in Wisconsin, with an average area of 2,740 acres each. There are 29 such enterprises of 5,000 acres or more each, 118 of between 500 and 5,000 acres, and 143 of less than 500 acres each. There is no overlapping of the enterprises in this state.

TABLE 5.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY SIZE OF AREA ASSESSED: 1920.

SIZE GROUP	Land in enterprises (acres).	ASSESSED AREA.	
		Acreage.	Per cent of total.
All operating enterprises.....	794,569	794,569	100.0
Less than 200 acres.....	5,800	5,800	0.7
200 to 499 acres.....	26,010	26,010	3.3
500 to 999 acres.....	27,975	27,975	3.5
1,000 to 4,999 acres.....	168,051	168,051	21.1
5,000 to 9,999 acres.....	75,427	75,427	9.5
10,000 to 49,999 acres.....	228,426	228,426	28.7
50,000 to 99,999 acres.....	262,880	262,880	33.1

Character of enterprises.—All drainage enterprises in Wisconsin, except commercial and private undertakings and districts formed by special acts of the legislature, are either drainage districts operating

under the drainage district law of July 15, 1919 (ch. 557), or "drainages" operating under the farm drainage law of June 27, 1919 (ch. 446). These statutes repealed the earlier laws of the state providing for the formation of drainage enterprises, except so far as might be necessary or expedient to complete undertakings already begun, and all drainage district works and town drains constructed under earlier laws are to be maintained under the new drainage district law and farm drainage law, respectively.

A drainage district is established, according to the law of 1919, by the circuit court of any county in which all or a part of the district is situated, after receipt of a petition from the owners of a major part of the land in the proposed district or from a majority of the owners representing one-third or more of the land. Three drainage commissioners for each district are appointed by the court to investigate as to the feasibility and public utility of the proposed work and, when the district has been established, to administer its affairs. The cost of drainage is assessed against the land in proportion to the benefits that will accrue to the various tracts, but that for any part of the work may be assessed against the particular land or corporation to be benefited by that part. If the cost will exceed the benefits, the enterprise is abandoned, unless one or more petitioners agree to pay the excess and furnish security therefor. The commissioners' preliminary report must include a report from the state chief engineer regarding the practicability and completeness of the proposed plan of improvement and a report from the college of agriculture of the University of Wisconsin regarding the character of the soils and the value of the land for agriculture. If the enterprise will affect any navigable stream, the plan must be approved by the state railroad commission. The plan of drainage improvement and the assessments of damages and of benefits are made by the drainage commissioners. The plan of drainage must be approved or disapproved by the state chief engineer. The court holds public hearings upon the petition for establishment, upon the commissioners' preliminary report, and upon their final report presenting plans, cost estimate, and assessments. The commissioners may issue bonds or notes of the district to finance the work. Subdistricts may be formed within any drainage district, by the circuit court, upon petition and after public hearing; the cost is to be assessed by the commissioners of the original drainage district against the land to be benefited.

Very nearly all the drainage districts in Wisconsin were established under the drainage district law of April 23, 1891 (ch. 401), and the revision of June 17, 1905 (ch. 419). Each of those statutes provided that the districts should be organized by the circuit courts and be administered by three commissioners for each district, and that the cost should be assessed in proportion to the anticipated benefits. The requirements

for establishment and the method of organization were much like those of the new drainage district law, but neither of the earlier statutes included any provisions similar to those now requiring that reports upon the proposed work and upon the value of the land be secured from the state chief engineer and the college of agriculture.

A "drainage" under the 1919 statute is established by the county court upon petition from the owners of a major part of the land affected or from a majority of the owners controlling one-third or more of that land, or upon petition from a majority of the town board or boards of supervisors of the town or towns in which the land is situated. All "drainages" are administered by the farm drainage board of the county, composed of three residents appointed by the court when the first petition for a "drainage" is filed. This drainage board makes a preliminary investigation as to the practicability and public utility of the project and, after the "drainage" has been established by decree of the court, prepares the plan of drainage, assesses damages and benefits against the tracts of land, and lets contracts for construction. Public hearings are held by the county court upon the drainage board's preliminary report before the "drainage" is established, and later upon the assessments of damages and of benefits. With its earlier report the drainage board must submit, if the "drainage" will comprise more than 200 acres, a report from the state chief engineer regarding the sufficiency of the proposed work and one from the college of agriculture concerning the character of the soil and the value of the land. The final plan of drainage must be approved by the state chief engineer. The cost of the enterprise may exceed the estimated benefits only if the petitioners give security to cover the excess. The drainage board may issue notes or bonds to finance the work of each "drainage."

Town drains established under laws of March 9, 1871 (ch. 64), and of June 25, 1913 (ch. 579), were in general similar to the "drainages" to be established under the present farm drainage law. Petition for a drain was addressed to the town board of supervisors, which performed approximately the same functions as now are prescribed for the county court and the farm drainage board. For a drain to benefit land within a city or village, petition was addressed to the officials of the city or village, who would appoint a committee to investigate and to construct the drain if the project was approved. The cost was apportioned against the land in proportion to the benefits, and the law of 1871 permitted the landowners to perform the work of construction. No supervision over individual projects was exercised by the state, corresponding to what now is done in requiring reports from the state chief engineer and the college of agriculture.

The first drainage law of this state was enacted in 1852, providing means for one landowner to secure

drainage outlet across the land of an objecting owner, if necessary, through petition to a justice of the peace. A somewhat similar act of 1880 provided for proceedings under the county and circuit courts; an act of 1887 provided for proceedings under the town supervisors. A statute of 1862 (ch. 398) authorized the establishment and construction of county drains by the county board of supervisors upon petition from one or more landowners, damages and benefits being assessed by the supervisors. As amended (Revised Statutes of 1917, sec. 1381) that law authorizes the construction of drains by the county or town boards of supervisors for the benefit of land owned by the counties or towns.

There have been many amendments to the drainage laws mentioned herein, but they have not affected the general form of organization described.

TABLE 6.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

CHARACTER OF ENTERPRISE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
* All organized enterprises.....	813,569	100.0	\$4,168,055	100.0	\$512,570
Operating enterprises.....	794,569	97.7	4,163,055	99.9	401,570
Drainage districts.....	684,888	84.2	3,460,032	83.0	346,820
Laws of 1891, ch. 401.....	266,183	36.4	1,373,060	32.9	35,600
Laws of 1905, ch. 419.....	379,705	48.7	2,041,972	49.0	311,220
Special acts.....	9,000	1.1	45,000	1.1	.....
"Drainages".....	105,601	13.0	664,423	15.9	54,750
Laws of 1871, ch. 64.....	49,619	6.1	186,664	4.5	750
Laws of 1913, ch. 579.....	53,140	6.5	449,152	10.8	54,000
Laws of 1919, ch. 446.....	2,842	0.3	28,607	0.7	.....
Other ¹	4,080	0.5	38,800	0.9	.....
Nonoperating enterprises.....	19,000	2.3	5,000	0.1	111,000
Drainage districts.....	19,000	2.3	5,000	0.1	111,000
Laws of 1905, ch. 419.....	15,500	1.9	1,500	.....	86,000
Laws of 1919, ch. 557.....	3,500	0.4	3,500	0.1	25,000

¹ Includes one commercial development, one individual ownership, and one enterprise not reporting character.

Drainage works.—The total works completed by drainage enterprises to December 31, 1919, comprised 1,691.3 miles of open ditches, 211.3 miles of tile drains, and 7.7 miles of accessory levees; the additional lengths under construction were 88.0 miles of open ditches, 40.1 miles of tile drains, and 2.5 miles of levees. These figures do not include drains or levees installed by individual farm owners supplemental to the works of the enterprises, nor the works of flood-protection or levee districts that had not undertaken the construction of ditches or tile drains. There is one drainage district in Wisconsin, comprising 6,597 acres, drained partly by pumping, having one centrifugal pump operated by steam engines of 150 horsepower.

The average depth of the main or outlet ditch was reported for each enterprise. The maximum depth of outlet reported for any enterprise in the state and the maximum in each county are shown in line 15 of County Table II. The maximum length, width, and depth of outlet shown in that table for any county may not refer to the same enterprise.

County Table II, line 16, shows the mean depth of branch ditches (open ditches only), which is a very crude indication of the depth of soil drainage that may be obtained in the enterprises, as determined by the depth of outlet provided for farm drains. The mean depth was computed by giving each separate depth a weight in proportion to the acreage it serves. As most enterprises reported depths in whole numbers only, the occasional decimals were omitted in making these computations. Depths less than 3 feet and those 10 feet and greater were omitted, because it seemed that they did not represent so well the average depths of outlet provided for all the farms in those districts. To include both of these groups, computed as 3 feet and 10 feet, respectively, would show the mean depth for the state 7.0 instead of 6.5 feet.

TABLE 7.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY KIND OF DRAINAGE WORKS: 1920.

KIND OF WORKS.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All kinds.....	794,569	100.0	\$4,163,055	100.0	\$401,570
Open ditches only.....	657,668	82.8	2,942,667	70.7	279,350
Open ditches and levees.....	27,584	3.5	282,866	6.8	.....
Tile drains only.....	2,958	0.4	59,770	1.4	.....
Open ditches and tile drains.....	102,359	12.9	834,952	20.1	72,220
Open ditches, tile drains, and levees.....	4,000	0.5	43,000	1.0	50,000

TABLE 8.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY AVERAGE DEPTH OF BRANCH DITCHES: 1920.

DEPTH OF BRANCH DITCHES.	Acreage.	Per cent of total.
All operating enterprises.....	794,569	100.0
Less than 3 feet.....	520	0.1
3.0 to 3.9 feet.....	17,669	2.2
4.0 to 4.9 feet.....	72,916	9.2
5.0 to 5.9 feet.....	25,622	3.2
6.0 to 6.9 feet.....	186,683	23.5
7.0 to 7.9 feet.....	79,349	10.0
8.0 to 8.9 feet.....	217,735	27.4
9.0 to 9.9 feet.....	18,000	2.3
10 feet and more.....	83,800	10.5
Not reporting branches.....	92,275	11.6

Maintenance of works.—The drainage district law of 1919 requires that the commissioners of each drainage district file with the circuit court each year a report including a statement of what repairs will be necessary during the coming year and an assessment to cover the necessary repairs, maintenance, and incidental expenses. The court hears all objections and determines the amounts of assessment. The laws of 1891 and 1905 also authorized the levy of assessments for maintenance of the drains.

The farm drainage law requires the farm drainage board of each county to report annually to the county court regarding each "drainage" under its control, including a statement of the repairs needed in the ensuing year and an assessment to cover the cost of maintenance apportioned according to the confirmed benefits. The court hears objections to the report before confirming the assessment. The town drain

law of 1913 authorized the town supervisors to levy assessments for repair purposes, and that of 1871 required each landowner affected to keep in repair the section of drain assigned to him by the town supervisors.

TABLE 9.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY METHOD OF MAINTENANCE: 1920.

METHOD OF MAINTENANCE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All operating enterprises.....	794,569	100.0	\$4,163,055	100.0	\$401,570
By district forces.....	181,416	22.8	1,038,827	25.0	2,750
By contract.....	349,388	44.0	2,109,393	50.7	39,600
By landowners.....	29,255	3.7	68,523	1.6	.....
By method not specified.....	14,386	1.9	152,947	3.7	.....
No maintenance provided.....	212,215	26.7	744,585	17.9	339,220
Not reporting.....	6,931	0.9	48,780	1.2	20,000

Date of organization.—The progress in drainage development is shown only roughly by the dates of the organization of the enterprises, which are the dates when the districts were established by the courts or the town boards of supervisors, since there may be a period of a year or more between the decree of establishment and the beginning of actual construction and since the work of construction might occupy some years in a large district. It was not practicable, however, for the census to secure data as to the time of the beginning or the completion of the drainage works.

TABLE 10.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	LAND.		AREA ASSESSED.	
	Acreage.	Per cent of total.	Acreage.	Per cent of total.
All operating enterprises.....	794,569	100.0	794,569	100.0
1870 to 1879.....	695	0.1	695	0.1
1880 to 1889.....	16,158	2.0	16,158	2.0
1890 to 1899.....	5,173	0.7	5,173	0.7
1900 to 1904.....	294,978	37.1	294,978	37.1
1905 to 1909.....	145,692	18.3	145,692	18.3
1910 to 1914.....	111,102	14.0	111,102	14.0
1915 to 1919.....	218,424	27.5	218,424	27.5
Not reported.....	2,347	0.3	2,347	0.3

Under the date of organization are tabulated the entire area, works, and capital of each enterprise, even including extensions made after the original plan of reclamation was completed.

TABLE 11.—CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	CAPITAL INVESTED.		
	To Dec. 31, 1919.		Additional required to complete.
	Amount.	Per cent of total.	
All operating enterprises.....	\$4,163,055	100.0	\$401,570
1870 to 1879.....	2,800	0.1	.....
1880 to 1889.....	65,966	1.6	.....
1890 to 1899.....	9,063	0.2	.....
1900 to 1904.....	1,314,577	31.6	36,350
1905 to 1909.....	1,042,098	25.0	.....
1910 to 1914.....	744,494	17.9	.....
1915 to 1919.....	963,693	23.1	365,220
Not reported.....	20,364	0.5	.....

TABLE 12.—DRAINS AND LEVEES (COMPLETED AND UNDER CONSTRUCTION) IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	DITCHES.		TILE.		LEVEES.	
	Miles.	Per cent of total.	Miles.	Per cent of total.	Miles.	Per cent of total.
All drains and levees.....	1,779.3	100.0	251.4	100.0	10.2	100.0
1870 to 1879.....	9.5	0.5	.....	.....	.....	.....
1880 to 1889.....	59.7	3.4	.....	.....	.....	.....
1890 to 1899.....	26.3	1.5	.....	.....	.....	.....
1900 to 1904.....	551.6	31.0	.....	.....	.....	.....
1905 to 1909.....	455.6	25.6	19.5	7.8	2.6	25.5
1910 to 1914.....	311.3	17.5	19.0	7.6	5.1	50.0
1915 to 1919.....	357.0	20.1	211.6	84.2	2.5	24.5
Not reported.....	8.3	0.5	1.3	0.5	.....	.....

Crops.—The principal crops grown upon the drained land in drainage enterprises are hay and corn. Data were not secured to show the part of each enterprise planted to any crop, so the enterprises have been classified according to the principal crop, and the total area of improved land is shown thus classified in County Table II. No data were secured at the general census of agriculture to separate the crops grown upon land drained artificially from those produced upon land drained naturally.

DRAINAGE—WISCONSIN.

COUNTY TABLE I.—DRAINAGE ON FARMS: 1920.

		THE STATE.	Adams.	Ashland.	Barron.	Bayfield.	Brown.	Buffalo.	Burnett.	Calumet.
1	Number of all farms in the state or county.....	189,295	1,557	1,131	4,516	1,791	3,498	2,089	1,872	2,087
2	Farms reporting land having drainage.....	21,838	87	32	117	252	517	51	145	255
3	Farms reporting land needing drainage.....	62,223	259	447	1,028	323	1,200	313	695	386
4	Farms in drainage and levee districts.....	3,693	34	2	22	-----	19	3	29	20
LAND AND FARM AREA.										
5	Approximate land area of the state or county..... acres..	35,363,840	437,760	692,480	566,400	661,920	338,560	439,680	550,400	207,360
6	All land in farms..... acres..	22,148,223	304,575	108,270	449,565	172,496	304,745	418,261	236,886	194,623
7	Improved land in farms..... acres..	12,452,216	148,138	36,253	208,936	50,389	207,027	202,321	79,611	145,005
8	Woodland in farms..... acres..	5,401,910	111,264	68,659	121,719	82,071	47,859	151,650	117,520	19,979
9	Other unimproved land in farms..... acres..	4,294,097	45,173	15,358	118,910	40,036	49,859	64,290	39,755	29,639
10	Farm land reported as provided with drainage..... acres..	658,411	7,827	665	2,477	5,460	12,761	1,069	4,035	5,660
11	Farm land reported as needing drainage..... acres..	1,839,273	13,245	27,845	41,158	15,835	30,578	8,019	33,012	7,084
12	Drainage only..... acres..	461,612	5,325	879	3,733	658	6,012	2,154	6,217	3,963
13	Drainage and clearing..... acres..	1,377,661	7,920	26,966	37,425	15,177	24,566	5,865	26,795	3,121

		Chip-pewa.	Clark.	Colum-bia.	Dane.	Dodge.	Door.	Douglas.	Dunn.	Eau Claire.	Fond du Lac.
1	Number of all farms in the county.....	3,729	5,116	3,320	6,217	4,633	2,396	1,557	3,566	2,368	4,190
2	Farms reporting land having drainage.....	123	188	436	721	1,051	181	55	123	91	635
3	Farms reporting land needing drainage.....	1,459	1,530	906	1,604	1,193	626	1,001	729	511	1,005
4	Farms in drainage and levee districts.....	22	32	231	177	187	11	3	36	17	77
LAND AND FARM AREA.											
5	Approximate land area of the county..... acres..	664,960	779,520	497,920	769,280	574,080	300,160	855,680	556,160	408,320	464,640
6	All land in farms..... acres..	457,998	476,377	463,639	721,156	522,217	264,126	154,671	490,044	307,346	446,710
7	Improved land in farms..... acres..	227,691	195,802	301,889	512,269	374,939	149,557	40,428	265,693	194,467	321,182
8	Woodland in farms..... acres..	130,048	137,131	66,362	85,501	36,202	79,959	69,791	150,405	68,504	32,672
9	Other unimproved land in farms..... acres..	100,259	143,444	95,388	123,386	111,076	34,610	44,452	73,946	44,375	92,856
10	Farm land reported as provided with drainage..... acres..	2,349	4,864	11,344	16,859	22,152	2,986	1,012	2,685	1,846	14,792
11	Farm land reported as needing drainage..... acres..	70,001	72,922	32,867	34,919	30,395	17,112	63,343	26,392	17,608	20,393
12	Drainage only..... acres..	6,411	5,128	18,285	24,215	21,689	3,596	1,089	3,432	2,030	12,744
13	Drainage and clearing..... acres..	63,590	67,794	14,582	10,704	8,706	13,516	62,254	22,960	15,573	7,649

		Forest.	Green.	Green Lake.	Iowa.	Jackson.	Jefferson.	Juneau.	Keno-sha.	Kewau-nee.	Lafay-ette.
1	Number of all farms in the county.....	535	2,330	1,507	2,527	2,577	3,263	2,479	1,383	2,065	2,360
2	Farms reporting land having drainage.....	6	219	131	67	87	1,022	537	861	455	107
3	Farms reporting land needing drainage.....	167	388	346	140	746	1,185	915	797	1,007	250
4	Farms in drainage and levee districts.....	-----	14	39	2	32	187	291	99	11	1
LAND AND FARM AREA.											
5	Approximate land area of the county..... acres..	650,880	379,520	230,400	499,840	633,600	353,280	513,280	180,480	215,680	410,880
6	All land in farms..... acres..	56,029	344,542	213,518	460,938	389,345	331,204	327,561	155,832	210,584	373,121
7	Improved land in farms..... acres..	16,950	270,680	141,371	254,424	190,401	218,129	171,114	112,255	146,626	272,481
8	Woodland in farms..... acres..	24,695	35,290	21,469	85,004	128,098	43,622	95,359	15,471	33,937	35,308
9	Other unimproved land in farms..... acres..	14,384	38,572	50,678	121,510	70,846	69,453	61,088	28,106	30,021	65,332
10	Farm land reported as provided with drainage..... acres..	637	6,835	4,422	1,069	4,621	23,459	35,627	39,804	14,083	2,803
11	Farm land reported as needing drainage..... acres..	10,703	9,210	10,804	3,400	37,328	31,875	39,698	24,636	21,768	5,843
12	Drainage only..... acres..	562	5,328	5,187	1,910	7,138	18,740	11,528	15,949	6,057	3,045
13	Drainage and clearing..... acres..	10,141	3,882	5,617	1,490	30,190	13,135	28,170	8,687	15,711	2,798

DRAINAGE—WISCONSIN.

COUNTY TABLE I.—DRAINAGE ON FARMS: 1920—Continued.

	Mani- towoc.	Mara- thon.	Mari- nette.	Mar- quette.	MI- waukee.	Monroe.	Oconto.	Outa- gamie.	Ozau- kea.	Pepin.
1	3,904	6,058	2,531	1,432	2,574	3,519	3,114	3,746	1,727	1,034
2	1,464	66	181	222	1,167	181	242	761	617	35
3	1,630	1,961	1,506	420	760	533	1,325	1,307	874	75
4	109	6	112	18	184	131	40	45	90	4
LAND AND FARM AREA.										
5	385,280	994,560	905,600	292,480	150,400	599,680	715,520	413,440	149,120	151,040
6	358,511	650,959	275,738	271,317	111,033	468,553	310,037	347,824	141,115	140,268
7	251,176	242,357	107,444	133,773	90,258	231,049	151,639	236,561	107,739	75,698
8	54,581	243,986	79,096	85,306	12,921	155,752	96,551	44,915	12,092	48,316
9	52,754	164,616	89,198	52,238	7,854	81,752	61,847	66,348	21,284	16,254
10	34,705	1,688	5,735	8,287	22,542	8,494	9,531	26,772	13,477	1,077
11	29,564	93,246	84,384	17,969	12,176	18,765	53,135	47,510	14,718	2,030
12	14,690	5,249	5,563	8,169	5,592	7,887	8,213	17,319	6,795	106
13	14,874	87,997	78,821	9,800	6,584	10,878	44,922	30,191	7,923	1,924

	Polk.	Portage.	Price.	Racine.	Rich- land.	Rock.	Rusk.	Sauk.	Sha- wano.	Sheboy- gan.
1	4,058	3,328	1,935	2,215	2,533	3,660	1,946	3,697	3,977	3,664
2	103	312	46	1,619	116	335	44	200	303	1,262
3	1,196	534	1,272	1,170	305	702	794	578	1,393	1,630
4	56	251	3	473	6	64	55	4	13	30
LAND AND FARM AREA.										
5	598,400	519,680	818,560	207,360	377,600	458,240	592,000	538,880	741,120	333,440
6	484,216	427,913	161,894	195,963	361,450	427,083	184,213	494,925	431,614	311,332
7	185,140	250,287	40,387	146,486	186,824	343,328	46,676	279,878	193,770	226,784
8	186,044	103,858	71,921	20,969	132,623	38,525	24,518	135,662	140,511	42,561
9	63,032	73,768	49,536	23,538	42,003	44,930	113,019	79,385	97,333	42,037
10	2,157	31,913	598	71,843	1,644	11,876	596	4,521	6,456	34,208
11	46,595	26,059	66,150	30,557	6,405	22,206	27,886	12,603	44,823	27,400
12	5,969	3,244	1,430	18,781	2,837	12,727	2,281	6,822	11,283	13,395
13	40,626	22,815	64,720	11,776	3,518	9,479	25,605	5,781	33,540	14,005

	Trem- peleau.	Wal- worth.	Wash- burn.	Wash- ington.	Wau- kesha.	Wau- paca.	Wau- shara.	Winne- bago.	Wood.	All other counties. ¹
1	3,138	2,779	1,380	2,799	3,406	3,770	2,468	2,711	3,066	26,469
2	98	560	23	623	1,075	345	190	709	350	137
3	576	972	422	1,129	306	1,142	372	1,023	893	4,271
4	10	59		87		62	18	44	108	13
LAND AND FARM AREA.										
5	478,720	353,400	534,400	275,840	351,360	485,760	413,440	293,760	517,760	7,578,880
6	461,525	330,011	178,298	264,351	333,519	420,206	363,417	256,327	321,907	3,356,325
7	270,239	239,308	57,827	174,486	227,310	236,807	233,745	186,332	137,063	1,705,897
8	135,567	33,037	71,401	38,230	52,073	92,965	84,493	25,511	79,030	970,046
9	55,719	52,666	49,070	51,635	54,136	90,434	45,179	44,484	105,814	680,382
10	1,293	16,020	633	9,339	18,202	7,473	6,595	21,468	22,876	2,189
11	14,644	26,322	27,953	20,584	5,659	32,364	11,908	24,778	44,836	183,056
12	6,331	18,959	4,100	13,144	2,863	12,993	4,636	14,639	8,358	14,183
13	8,313	7,363	23,853	7,440	2,796	19,371	7,272	10,139	36,478	173,873

¹No drainage on farms reported in Crawford, Florence, Grant, Iron, La Crosse, Langlade, Lincoln, Oneida, Pierce, St. Croix, Sawyer, Taylor, Vernon, and Vilas Counties.

DRAINAGE—WISCONSIN.

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COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920.

	THE STATE.	Adams.	Clark.	Columbia.	Dane.	Dodge.	Door.	Fond du Lac.	
LAND AREA.									
1	Approximate land area of the state or county..... acres..	35,363,840	437,760	779,520	497,920	769,280	574,080	300,160	464,640
2	All land in operating drainage enterprises..... acres..	794,569	16,390	98,000	4,668	39,239	21,597	4,000	5,935
3	Improved land..... acres..	254,504	9,834	9,800	2,204	6,535	4,482	600	1,778
4	Per cent of all improved land in farms.....	2.0	6.6	5.0	0.7	1.3	1.2	0.4	0.6
5	Timber and cut-over land..... acres..	177,744	4,098	68,600	.....	.....	108	800	389
6	Other unimproved land..... acres..	362,321	2,458	19,600	2,464	32,704	17,007	2,600	3,768
7	Swampy or subject to overflow, in enterprises..... acres..	130,111	2,458	49,000	985	6,896	3,291	1,000	925
8	Suffering a loss of crops from defective drainage..... acres..	9,848	983	.....	28	30	200	.....	25
9	Assessed acreage..... acres..	794,569	16,390	98,000	4,668	39,239	21,597	4,000	5,935
10	Excess over all land in operating enterprises..... acres..	.....	.....	.....	.....	.....	.....	.....	.....
DRAINAGE WORKS.									
Open ditches:									
11	Completed..... miles..	1,691.3	50.3	23.3	24.2	114.0	103.0	1.1	28.6
12	Additional under construction..... miles..	88.0	.....	46.7	.....	5.8	.....	0.9	.....
13	Maximum completed in any enterprise..... miles..	144.5	50.3	23.3	7.0	26.0	10.5	1.1	4.0
14	Maximum width at bottom of ditch ¹ feet..	60	16	10	8	24	8	3	40
15	Maximum of average depths of outlet ditches ¹ feet..	13.0	8.0	6.0	10.0	10.0	10.0	4.0	7.0
16	Mean depth of branch ditches ¹ feet..	6.5	8.0	6.0	5.1	5.0	3.7	.....	7.0
Tile drains:									
17	Completed..... miles..	211.3	.....	.....	.....	97.0	3.7	.....	0.3
18	Additional under construction..... miles..	40.1	.....	.....	.....	7.3	.....	5.5	.....
19	Maximum completed in any enterprise..... miles..	43.0	.....	.....	.....	43.0	1.2	.....	0.3
20	Maximum size of tile ¹ inches..	30	.....	.....	.....	24	24	.....	12
Accessory levees and dikes:									
21	Completed..... miles..	7.7	.....	.....	.....	.....	.....	.....	.....
22	Additional under construction..... miles..	2.5	.....	.....	.....	.....	.....	.....	.....
Pumping plants:									
23	Engine capacity..... horsepower..	150	.....	.....	.....	.....	.....	.....	.....
24	Pump capacity..... gallons per minute..	.....	.....	.....	.....	.....	.....	.....	.....
25	Area served by pumps..... acres..	6,597	.....	.....	.....	.....	.....	.....	.....
26	Area drained by open ditches only ¹ acres..	657,668	16,390	98,000	4,668	25,898	19,259	.....	5,435
27	Length of these ditches..... miles..	1,462.6	50.3	70.0	24.2	88.2	93.0	.....	23.3
28	Average length per acre..... feet..	11.7	16.2	3.8	27.4	18.3	25.5	.....	25.3
29	Area having open ditches and levees ¹ acres..	27,584	.....	.....	.....	.....	.....	.....	.....
30	Length of these ditches..... miles..	79.1	.....	.....	.....	.....	.....	.....	.....
31	Average length per acre..... feet..	15.1	.....	.....	.....	.....	.....	.....	.....
32	Length of the accessory levees..... miles..	7.7	.....	.....	.....	.....	.....	.....	.....
33	Area drained by tile only ¹ acres..	2,958	.....	.....	.....	1,270	60	.....	.....
34	Length of these tile..... miles..	97.2	.....	.....	.....	83.0	1.0	.....	.....
35	Average length per acre..... feet..	173.5	.....	.....	.....	345.1	88.0	.....	.....
36	Area drained by open ditches and tile ¹ acres..	102,359	.....	.....	.....	12,571	2,278	4,000	450
37	Length of these drains..... miles..	347.6	.....	.....	.....	32.9	12.7	7.5	2.6
38	Average length per acre..... feet..	17.9	.....	.....	.....	22.2	29.4	9.9	30.5
39	Area having open ditches, tile drains, and levees ¹ acres..	4,000	.....	.....	.....	.....	.....	.....	.....
40	Length of these drains..... miles..	44.2	.....	.....	.....	.....	.....	.....	.....
41	Average length per acre..... feet..	58.3	.....	.....	.....	.....	.....	.....	.....
42	Length of the accessory levees..... miles..	2.5	.....	.....	.....	.....	.....	.....	.....
DEVELOPMENT OF LAND.									
43	Improved land in operating enterprises, 1920..... acres..	254,504	9,834	9,800	2,204	6,535	4,482	600	1,778
44	Improved land prior to drainage..... acres..	50,071	.....	9,800	.....	1,333	398	.....	761
45	Increase since drainage..... acres..	204,433	9,834	.....	2,204	5,202	4,084	600	1,017
46	Per cent of increase.....	408.3	.....	.....	.....	390.2	.....	.....	133.6
47	Per cent increase is of all improved land in farms, 1920.....	1.6	6.6	.....	0.7	1.0	1.1	0.4	0.3
48	Timber and cut-over land, 1920..... acres..	177,744	4,098	68,600	.....	.....	108	800	389
49	Timber and cut-over land prior to drainage..... acres..	231,732	12,292	68,600	.....	1,220	144	800	389
50	Decrease since drainage..... acres..	53,988	8,194	.....	.....	1,220	36	.....	.....
51	Per cent of decrease.....	23.3	66.7	.....	.....	100.0	25.0	.....	.....
52	Other unimproved land, 1920..... acres..	362,321	2,458	19,600	2,464	32,704	17,007	2,600	3,768
53	Other unimproved land prior to drainage..... acres..	512,766	4,098	19,600	4,668	21,055	3,200	.....	4,785
54	Decrease since drainage..... acres..	150,445	1,640	.....	2,204	3,982	4,048	600	1,017
55	Per cent of decrease.....	29.3	40.0	.....	47.2	10.9	19.2	18.8	21.3
56	Swampy or subject to overflow, 1920..... acres..	130,111	2,458	49,000	985	6,896	3,291	1,000	925
57	Swampy or subject to overflow prior to drainage..... acres..	701,307	16,390	68,600	4,668	37,779	21,357	2,400	5,333
58	Decrease since drainage..... acres..	571,196	13,932	19,600	3,683	30,883	18,066	1,400	4,408
59	Per cent of decrease.....	81.4	85.0	28.6	78.9	81.7	84.6	58.3	82.7
CAPITAL INVESTED AND COST PER ACRE.									
60	Total capital invested in and required for completion of operating enterprises..... dollars..	4,564,625	98,000	159,000	41,352	346,313	95,545	28,000	72,066
61	Capital invested in these enterprises to Dec. 31, 1919..... dollars..	4,163,055	98,000	144,000	41,352	326,313	95,545	3,000	72,066
62	Additional capital required to complete these enterprises..... dollars..	401,570	.....	115,000	.....	20,000	.....	25,000	.....
63	Average cost per acre when completed..... dollars..	5.74	5.98	1.62	8.86	8.83	4.42	7.00	12.14
64	Enterprises constructing open ditches only..... dollars..	3,222,017	98,000	159,000	41,352	190,607	52,755	.....	65,509
65	Average cost per acre when completed..... dollars..	4.90	5.98	1.62	8.86	7.50	2.74	.....	11.94
66	Enterprises constructing open ditches and levees..... dollars..	282,666	.....	.....	.....	.....	.....	.....	.....
67	Average cost per acre when completed..... dollars..	10.25	.....	.....	.....	.....	.....	.....	.....
68	Enterprises constructing tile drains only..... dollars..	59,770	.....	.....	.....	33,000	1,000	.....	.....
69	Average cost per acre when completed..... dollars..	20.21	.....	.....	.....	25.98	16.67	.....	.....
70	Enterprises constructing open ditches and tile drains..... dollars..	907,172	.....	.....	.....	122,706	41,790	28,000	6,557
71	Average cost per acre when completed..... dollars..	8.86	.....	.....	.....	9.76	18.35	7.00	14.57
72	Enterprises constructing open ditches, tile drains, and levees..... dollars..	93,000	.....	.....	.....	.....	.....	.....	.....
73	Average cost per acre when completed..... dollars..	23.25	.....	.....	.....	.....	.....	.....	.....
CROPS.									
74	Improved land in enterprises reporting—	.....	.....	.....	.....	.....	.....	.....	.....
75	Hay as principal crop on drained land..... acres..	97,966	9,834	.....	1,606	2,744	680	600	306
76	Corn as principal crop on drained land..... acres..	97,075	.....	.....	38	2,121	3,802	.....	932
77	Small grains as principal crop on drained land..... acres..	24,066	.....	.....	560	200	.....	.....	.....
78	Vegetables as principal crop on drained land..... acres..	2,647	.....	.....	.....	1,470	.....	.....	.....
79	Other crops as principal ones on drained land..... acres..	19,590	.....	.....	.....	.....	.....	.....	.....
80	Not reporting principal crop on drained land..... acres..	13,160	.....	9,800	.....	.....	.....	.....	540

¹ When works under construction have been completed.

DRAINAGE—WISCONSIN.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920—Continued.

	Jackson.	Jefferson.	Juneau.	Kenosha.	Marathon.	Milwaukee.	Monroe.	Oconto.	
LAND AREA.									
1	Approximate land area of the county..... acres.	633,600	353,280	513,280	180,480	994,560	150,400	599,680	715,520
2	All land in operating drainage enterprises..... acres.	46,760	17,461	133,297	11,803	11,679	8,392	61,100	4,300
3	Improved land..... acres.	4,140	5,630	27,904	10,277	2,336	7,355	27,641	2,000
4	Per cent of all improved land in farms.....	2.2	2.6	16.3	9.2	1.0	8.1	12.0	1.3
5	Timber and cut-over land..... acres.	15,264	18	38,069		8,175		21,472	490
6	Other unimproved land..... acres.	27,356	11,813	67,324	1,526	1,168	1,037	11,987	1,810
7	Swampy or subject to overflow, in enterprises..... acres.		1,436	7,014	1,004			29,158	770
8	Suffering a loss of crops from defective drainage..... acres.		204	445				1,162	
9	Assessed acreage.....	46,760	17,461	133,297	11,803	11,679	8,392	61,100	4,300
10	Excess over all land in operating enterprises..... acres.								
DRAINAGE WORKS.									
11	Open ditches: Completed..... miles.	25.2	93.4	289.3	14.5	19.0	49.2	80.3	12.3
12	Additional under construction..... miles.	4.8		9.2				0.8	4.9
13	Maximum completed in any enterprise..... miles.	13.0	5.6	144.5	7.0	19.0	8.5	50.8	11.3
14	Maximum width at bottom of ditch ¹ feet.	30	8	40	30	60	18	20	10
15	Maximum of average depths of outlet ditches..... feet.	10.0	7.0	10.0	9.0	8.0	9.0	10.0	6.5
16	Mean depth of branch ditches ¹ feet.	7.0	3.2	6.1	7.0	7.0		7.4	5.7
17	Tile drains: Completed..... miles.		8.2		10.0		4.8		
18	Additional under construction..... miles.				0.7				1.0
19	Maximum completed in any enterprise..... miles.		3.5		4.2		2.3		
20	Maximum size of tile ¹ inches.		18		30		20		
21	Accessory levees and dikes: Completed..... miles.			0.8					
22	Additional under construction..... miles.								
23	Pumping plants: Engine capacity..... horsepower.								
24	Pump capacity..... gallons per minute.								
25	Area served by pumps..... acres.								
26	Area drained by open ditches only ¹ acres.	46,760	16,337	128,357	40	11,679	7,332	61,100	600
27	Length of these ditches..... miles.	30.0	83.4	282.5	0.5	19.0	47.2	81.1	1.0
28	Average length per acre..... feet.	3.4	28.6	11.6	66.0	8.6	34.0	7.0	8.8
29	Area having open ditches and levees ¹ acres.			4,040					
30	Length of these ditches..... miles.			16.0					
31	Average length per acre..... feet.			17.1					
32	Length of the accessory levees..... miles.			0.8					
33	Area drained by tile only ¹ acres.		230			820			
34	Length of these tile..... miles.		2.9			3.8			
35	Average length per acre..... feet.		66.6			24.5			
36	Area drained by open ditches and tile ¹ acres.		894		11,763	240			3,700
37	Length of these drains..... miles.		10.3		24.7	3.0			17.2
38	Average length per acre..... feet.		60.8		11.1	66.0			24.5
39	Area having open ditches, tile drains, and levees ¹ acres.								
40	Length of these drains..... miles.								
41	Average length per acre..... feet.								
42	Length of the accessory levees..... miles.								
DEVELOPMENT OF LAND.									
43	Improved land in operating enterprises, 1920..... acres.	4,140	5,630	27,904	10,277	2,336	7,355	27,641	2,000
44	Improved land prior to drainage..... acres.	2,500	50	3,271	4			3,384	1,430
45	Increase since drainage..... acres.	1,640	5,580	24,633	10,273	2,336	7,355	24,257	520
46	Per cent of increase ¹	65.6		753.1				716.8	35.1
47	Per cent increase is of all improved land in farms, 1920.....	0.9	2.6	14.4	9.2	1.0	8.1	10.5	0.3
48	Timber and cut-over land, 1920..... acres.	15,264	18	38,069		8,175		21,472	490
49	Timber and cut-over land prior to drainage..... acres.	15,264	18	41,309	280	10,511		45,344	490
50	Decrease since drainage..... acres.			3,240	280	2,336		23,872	
51	Per cent of decrease.....			7.8	100.0	22.2		52.6	
52	Other unimproved land, 1920..... acres.	27,356	11,813	67,324	1,526	1,168	1,037	11,987	1,810
53	Other unimproved land prior to drainage..... acres.	28,996	17,393	88,717	11,519	1,168	8,392	12,872	2,330
54	Decrease since drainage..... acres.	1,640	5,580	21,393	9,993	7,355	885	385	520
55	Per cent of decrease.....	5.7	32.1	24.1	86.8		87.6	3.1	22.3
56	Swampy or subject to overflow, 1920..... acres.		1,436	7,014	1,004			29,158	770
57	Swampy or subject to overflow prior to drainage..... acres.	28,996	17,461	126,540	11,519	11,679	8,392	57,100	2,420
58	Decrease since drainage..... acres.	28,996	16,025	119,526	10,515	11,679	8,392	27,942	1,650
59	Per cent of decrease.....	100.0	91.8	94.5	91.3	100.0	100.0	48.9	68.2
CAPITAL INVESTED AND COST PER ACRE.									
60	Total capital invested in and required for completion of operating enterprises..... dollars.	113,570	47,187	761,004	100,100	53,200	110,120	167,039	44,232
61	Capital invested in these enterprises to Dec. 31, 1919..... dollars.	101,800	47,187	739,100	100,100	53,200	110,120	165,113	30,012
62	Additional capital required to complete these enterprises..... dollars.	11,770		21,904				1,926	14,220
63	Average cost per acre when completed..... dollars.	2.43	2.70	5.71	8.48	4.56	13.12	2.73	10.29
64	Enterprises constructing open ditches only..... dollars.	113,570	29,334	711,504	400	53,200	95,141	167,039	312
65	Average cost per acre when completed..... dollars.	2.43	1.80	5.54	10.00	4.56	12.98	2.73	0.52
66	Enterprises constructing open ditches and levees..... dollars.			49,500					
67	Average cost per acre when completed..... dollars.			10.02					
68	Enterprises constructing tile drains only..... dollars.		4,753				6,479		
69	Average cost per acre when completed..... dollars.		20.67				7.90		
70	Enterprises constructing open ditches and tile drains..... dollars.		13,100		99,700		8,500		43,920
71	Average cost per acre when completed..... dollars.		14.65		8.48		35.42		11.87
72	Enterprises constructing open ditches, tile drains, and levees..... dollars.								
73	Average cost per acre when completed..... dollars.								
CROPS.									
74	Improved land in enterprises reporting—								
75	Hay as principal crop on drained land..... acres.	1,640	181	8,905		2,336		23,622	150
76	Corn as principal crop on drained land..... acres.		5,129	1,500	10,249		6,345	4,000	
77	Small grains as principal crop on drained land..... acres.			15,050					
78	Vegetables as principal crop on drained land..... acres.								
79	Other crops as principal ones on drained land..... acres.			2,449	28		910	19	1,850
80	Not reporting principal crop on drained land..... acres.	2,500	320				100		

¹ When works under construction have been completed.

² Per cent not shown when more than 1,000.

DRAINAGE—WISCONSIN.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920—Continued.

		Outagamie.	Ozaukee.	Portage.	Racine.	Rock.	Rusk.	Shawano.	Sheboygan.
LAND AREA.									
1	Approximate land area of the county.....	acres.. 413,440	149,120	519,680	207,360	458,240	592,000	741,120	333,440
2	All land in operating drainage enterprises.....	acres.. 18,305	5,960	67,567	61,847	15,792	5,174	4,600	7,106
3	Improved land.....	acres.. 5,468	4,462	21,734	47,265	5,372	1,104	2,970	561
4	Per cent of all improved land in farms.....	2.3	4.1	8.7	32.3	1.6	2.4	1.5	0.2
5	Timber and cut-over land.....	acres.. 649	928	.....	2,920	.....	174	.....	3,206
6	Other unimproved land.....	acres.. 12,188	570	45,833	11,662	10,420	3,896	1,630	3,339
7	Swampy or subject to overflow, in enterprises.....	acres.. 530	.....	5,500	5,562	4,656	712	720	4,000
8	Suffering a loss of crops from defective drainage.....	acres.. 18,305	5,960	67,567	61,847	15,792	5,174	4,600	7,106
9	Assessed acreage.....	.....	.....	.....	.....	.....	.....	.....	.....
10	Excess over all land in operating enterprises.....	acres.. 18,305	5,960	67,567	61,847	15,792	5,174	4,600	7,106
DRAINAGE WORKS.									
Open ditches:									
11	Completed.....	miles.. 68.4	23.7	153.4	95.3	30.5	17.6	16.0	23.4
12	Additional under construction.....	miles.. 6.6	1.0	.....	.....	.....	.....	1.1	6.2
13	Maximum completed in any enterprise.....	miles.. 23.4	4.9	108.0	37.5	9.0	5.8	5.0	18.8
14	Maximum width at bottom of ditch ¹	feet.. 6	25	60	30	20	2	6	36
15	Maximum of average depths of outlet ditches ¹	feet.. 8.0	8.0	8.0	12.0	8.0	9.0	8.0	13.0
16	Mean depth of branch ditches ¹	feet.. 4.3	6.6	7.8	7.0	5.9	3.0	.....	7.0
Tile drains:									
17	Completed.....	miles.. 14.2	2.1	.....	31.7	.....	36.1	.....	4.4
18	Additional under construction.....	miles.. 0.4	.....	.....	0.4	.....	11.0	.....	.....
19	Maximum completed in any enterprise.....	miles.. 1.1	.....	.....	10.3	.....	26.7	.....	2.0
20	Maximum size of tile ¹	inches.. 16	15	.....	24	.....	16	.....	15
Accessory levees and dikes:									
21	Completed.....	miles.. 1.0	.....	.....	.....	.....	.....	.....	.....
22	Additional under construction.....	miles.. 2.5	.....	.....	.....	.....	.....	.....	.....
Pumping plants:									
23	Engine capacity.....	horsepower.....	.....	.....	.....	.....	.....	.....	.....
24	Pump capacity.....	gallons per minute.....	.....	.....	.....	.....	.....	.....	.....
25	Area served by pumps.....	acres.....	.....	.....	.....	.....	.....	.....	.....
26	Area drained by open ditches only ¹	acres.. 12,618	4,238	67,567	7,000	15,792	1,028	4,600	6,580
27	Length of these ditches.....	miles.. 38.2	19.8	153.4	7.0	30.5	7.5	17.1	28.0
28	Average length per acre.....	feet.. 16.0	24.7	12.0	5.3	10.2	38.5	19.6	22.5
29	Area having open ditches and levees ¹	acres.. 1,687	.....	.....	.....	.....	.....	.....	.....
30	Length of these ditches.....	miles.. 6.8	.....	.....	.....	.....	.....	.....	.....
31	Average length per acre.....	feet.. 21.3	.....	.....	.....	.....	.....	.....	.....
32	Length of the accessory levees.....	miles.. 1.0	.....	.....	.....	.....	.....	.....	.....
33	Area drained by tile only ¹	acres.. 22	.....	.....	.....	.....	.....	.....	276
34	Length of these tile.....	miles.. 1.0	.....	.....	.....	.....	.....	.....	4.0
35	Average length per acre.....	feet.. 240.0	.....	.....	.....	.....	.....	.....	76.5
36	Area drained by open ditches and tile ¹	acres.. 1,700	.....	.....	54,847	.....	4,146	.....	250
37	Length of these drains.....	miles.. 6.0	.....	.....	120.4	.....	57.2	.....	2.0
38	Average length per acre.....	feet.. 18.6	.....	.....	11.6	.....	72.8	.....	42.2
39	Area having open ditches, tile drains, and levees ¹	acres.. 4,000	.....	.....	.....	.....	.....	.....	.....
40	Length of these drains.....	miles.. 44.2	.....	.....	.....	.....	.....	.....	.....
41	Average length per acre.....	feet.. 58.3	.....	.....	.....	.....	.....	.....	.....
42	Length of the accessory levees.....	miles.. 2.5	.....	.....	.....	.....	.....	.....	.....
DEVELOPMENT OF LAND.									
43	Improved land in operating enterprises, 1920.....	acres.. 5,468	4,462	21,734	47,265	5,372	1,104	2,970	561
44	Improved land prior to drainage.....	acres.. 1,463	278	.....	22,276	43	105	1,120	25
45	Increase since drainage.....	acres.. 4,005	4,184	21,734	24,989	5,329	999	1,850	536
46	Per cent of increase ²	273.8	.....	.....	112.2	.....	951.4	165.2	.....
47	Per cent increase is of all improved land in farms, 1920.....	1.7	3.9	8.7	17.1	1.6	2.1	1.0	0.2
48	Timber and cut-over land, 1920.....	acres.. 649	928	.....	2,920	.....	174	.....	3,206
49	Timber and cut-over land prior to drainage.....	acres.. 2,905	1,202	7,746	2,920	.....	174	.....	3,387
50	Decrease since drainage.....	acres.. 2,256	274	7,746	.....	.....	.....	.....	181
51	Per cent of decrease.....	77.7	22.8	100.0	.....	.....	.....	.....	5.3
52	Other unimproved land, 1920.....	acres.. 12,188	570	45,833	11,662	10,420	3,896	1,630	3,339
53	Other unimproved land prior to drainage.....	acres.. 13,937	4,480	59,821	36,651	15,749	4,895	3,480	3,694
54	Decrease since drainage.....	acres.. 1,749	3,910	13,988	24,989	5,329	999	1,850	355
55	Per cent of decrease.....	12.5	87.3	23.4	68.2	33.8	20.4	53.2	9.6
56	Swampy or subject to overflow, 1920.....	acres.. 530	.....	5,500	5,562	4,656	712	720	4,000
57	Swampy or subject to overflow prior to drainage.....	acres.. 11,088	5,960	67,567	49,907	15,792	3,740	4,600	7,106
58	Decrease since drainage.....	acres.. 10,558	5,960	62,067	44,345	11,136	3,028	3,880	3,106
59	Per cent of decrease.....	95.2	100.0	91.9	88.9	70.5	81.0	84.3	43.7
CAPITAL INVESTED AND COST PER ACRE.									
60	Total capital invested in and required for completion of operating enterprises.....	dollars.. 167,540	63,160	441,920	406,000	88,375	82,516	10,490	260,033
61	Capital invested in these enterprises to Dec. 31, 1919.....	dollars.. 117,540	60,160	441,920	406,000	88,375	69,516	9,740	135,033
62	Additional capital required to complete these enterprises.....	dollars.. 50,000	3,000	.....	.....	.....	13,000	750	125,000
63	Average cost per acre when completed.....	dollars.. 9.15	10.60	6.54	6.56	5.60	15.95	2.28	36.59
64	Enterprises constructing open ditches only.....	dollars.. 59,874	24,660	441,920	35,000	88,375	7,617	10,490	238,900
65	Average cost per acre when completed.....	dollars.. 4.75	5.82	6.54	5.00	5.60	7.41	2.28	36.31
66	Enterprises constructing open ditches and levees.....	dollars.. 14,666	.....	.....	.....	.....	.....	.....	.....
67	Average cost per acre when completed.....	dollars.. 8.69	.....	.....	.....	.....	.....	.....	.....
68	Enterprises constructing tile drains only.....	dollars.. 1,000	.....	.....	.....	.....	.....	.....	8,633
69	Average cost per acre when completed.....	dollars.. 45.45	.....	.....	.....	.....	.....	.....	31.28
70	Enterprises constructing open ditches and tile drains.....	dollars.. 37,500	.....	.....	371,000	.....	74,899	.....	12,500
71	Average cost per acre when completed.....	dollars.. 22.06	.....	.....	6.76	.....	18.07	.....	50.00
72	Enterprises constructing open ditches, tile drains, and levees.....	dollars.. 93,000	.....	.....	.....	.....	.....	.....	.....
73	Average cost per acre when completed.....	dollars.. 23.25	.....	.....	.....	.....	.....	.....	.....
CROPS.									
74	Improved land in enterprises reporting—	.....	.....	.....	.....	.....	.....	.....	.....
75	Hay as principal crop on drained land.....	acres.. 4,068	1,575	20,054	.....	.....	865	1,570	150
76	Corn as principal crop on drained land.....	acres.. 2,887	.....	.....	39,713	5,372	.....	.....	411
77	Small grains as principal crop on drained land.....	acres.. 1,080	.....	.....	.....	.....	.....	1,400	.....
78	Vegetables as principal crop on drained land.....	acres.. 1,400	.....	.....	.....	.....	239	.....	.....
79	Other crops as principal ones on drained land.....	acres.. 600	.....	.....	7,552	.....	.....	.....	.....
80	Not reporting principal crop on drained land.....	acres.. ..	.....	.....	.....	.....	.....	.....	.....

¹ When works under construction have been completed.

² Per cent not shown when more than 1,000.

DRAINAGE—WISCONSIN.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920—Continued.

	Trem- peleau	Wal- worth.	Washing- ton.	Wauke- sha.	Wau- shara.	Winne- bago.	Wood.	Other counties. ¹	
LAND AREA.									
1	Approximate land area of the county.....acres	478,720	358,400	275,840	351,360	413,440	293,760	517,760	5,087,360
2	All land in operating drainage enterprises.....acres	4,301	8,910	4,500	7,848	7,240	6,246	64,343	20,209
3	Improved land.....acres	430	4,048	330	4,757	456	3,710	18,911	10,410
4	Per cent of all improved land in farms.....	0.2	1.7	0.2	2.1	0.2	2.0	13.8	0.5
5	Timber and cut-over land.....acres	2,581	.....	2,825	419	190	.....	4,536	1,833
6	Other unimproved land.....acres	1,290	4,862	1,345	2,672	6,594	2,536	40,896	7,966
7	Swampy or subject to overflow, in enterprises.....acres	.....	.....	.....	501	794	.....	.....	3,199
8	Suffering a loss of crops from defective drainage.....acres	.....	.....	.....	288	57	.....	.....	440
9	Assessed acreage.....acres	4,301	8,910	4,500	7,848	7,240	6,246	64,343	20,209
10	Excess over all land in operating enterprises.....acres	.....	.....	.....	.....	.....	.....	.....	.....
DRAINAGE WORKS.									
11	Open ditches: Completed.....miles	7.3	23.3	20.5	35.1	16.9	10.0	137.0	85.2
12	Additional under construction.....miles	.....	.....	.....	.....	.....	.....	.....	.....
13	Maximum completed in any enterprise.....miles	7.3	11.2	7.5	10.0	9.0	6.0	47.0	15.0
14	Maximum width at bottom of ditch ².....feet	30	20	25	20	16	10	60	30
15	Maximum of average depths of outlet ditches ².....feet	6.0	9.0	8.0	8.0	8.0	7.0	10.0	10.0
16	Mean depth of branch ditches ².....feet	6.0	7.0	7.0	4.9	8.0	.....	7.1	5.0
17	Tile drains: Completed.....miles	.....	7.5	0.5	5.0	.....	.....	.....	.....
18	Additional under construction.....miles	.....	.....	.....	.....	.....	.....	.....	.....
19	Maximum completed in any enterprise.....miles	.....	6.0	0.5	5.0	.....	.....	.....	.....
20	Maximum size of tile ².....inches	.....	14	8	10	.....	.....	.....	.....
21	Accessory levees and dikes: Completed.....miles	4.8	.....	.....	.....	.....	.....	0.8	0.3
22	Additional under construction.....miles	.....	.....	.....	.....	.....	.....	.....	.....
23	Pumping plants: Engine capacity.....horsepower	.....	.....	.....	.....	.....	.....	.....	150
24	Pump capacity.....gallons per minute	.....	.....	.....	.....	.....	.....	.....	.....
25	Area served by pumps.....acres	4,301	.....	.....	.....	.....	.....	.....	2,296
26	Area drained by open ditches only ².....acres	.....	4,810	4,300	6,348	7,240	6,246	49,983	17,913
27	Length of these ditches.....miles	.....	14.7	19.5	26.1	16.9	10.0	90.0	83.2
28	Average length per acre.....feet	.....	16.1	23.9	20.9	12.3	8.5	9.5	24.5
29	Area having open ditches and levees ².....acres	4,301	.....	.....	.....	.....	.....	14,360	2,296
30	Length of these ditches.....miles	7.3	.....	.....	.....	.....	.....	47.0	2.0
31	Average length per acre.....feet	9.0	.....	.....	.....	.....	.....	17.3	4.6
32	Length of the accessory levees.....miles	4.8	.....	.....	.....	.....	.....	0.8	0.3
33	Area drained by tile only ².....acres	.....	280	.....	.....	.....	.....	.....	.....
34	Length of these tile.....miles	.....	1.5	.....	.....	.....	.....	.....	.....
35	Average length per acre.....feet	.....	28.3	.....	.....	.....	.....	.....	.....
36	Area drained by open ditches and tile ².....acres	.....	3,820	200	1,500	.....	.....	.....	.....
37	Length of these drains.....miles	.....	14.6	1.5	15.0	.....	.....	.....	.....
38	Average length per acre.....feet	.....	20.2	39.6	52.8	.....	.....	.....	.....
39	Area having open ditches, tile drains, and levees ².....acres	.....	.....	.....	.....	.....	.....	.....	.....
40	Length of these drains.....miles	.....	.....	.....	.....	.....	.....	.....	.....
41	Average length per acre.....feet	.....	.....	.....	.....	.....	.....	.....	.....
42	Length of the accessory levees.....miles	.....	.....	.....	.....	.....	.....	.....	.....
DEVELOPMENT OF LAND.									
43	Improved land, in operating enterprises, 1920.....acres	430	4,048	330	4,757	456	3,710	18,911	10,410
44	Improved land prior to drainage.....acres	.....	130	40	.....	.....	.....	200	1,410
45	Increase since drainage.....acres	430	2,918	290	4,757	456	3,710	18,711	9,000
46	Per cent of increase ⁴.....	.....	.....	725.0	.....	.....	.....	.....	638.3
47	Per cent increase is of all improved land in farms, 1920.....	0.2	1.6	0.2	2.1	0.2	2.0	13.7	0.4
48	Timber and cut-over land, 1920.....acres	2,581	.....	2,825	419	190	.....	4,536	1,833
49	Timber and cut-over land prior to drainage.....acres	2,581	.....	2,975	1,169	570	.....	7,279	2,163
50	Decrease since drainage.....acres	.....	.....	150	750	380	.....	2,743	330
51	Per cent of decrease.....	.....	.....	5.0	64.2	66.7	.....	37.7	15.3
52	Other unimproved land, 1920.....acres	1,290	4,862	1,345	2,672	6,594	2,536	40,896	7,966
53	Other unimproved land prior to drainage.....acres	1,720	8,780	1,485	6,679	6,670	6,246	56,864	16,636
54	Decrease since drainage.....acres	430	3,918	140	4,007	76	3,710	15,968	8,670
55	Per cent of decrease.....	25.0	44.6	9.4	60.0	1.1	59.4	28.1	52.1
56	Swampy or subject to overflow, 1920.....acres	.....	.....	.....	501	794	.....	.....	3,199
57	Swampy or subject to overflow prior to drainage.....acres	4,301	8,910	4,500	7,848	7,240	6,246	59,807	16,061
58	Decrease since drainage.....acres	4,301	8,910	4,500	7,847	6,446	6,246	59,807	12,802
59	Per cent of decrease.....	100.0	100.0	100.0	93.6	89.0	100.0	100.0	80.1
CAPITAL INVESTED AND COST PER ACRE.									
60	Total capital invested in and required for completion of operating enterprises.....dollars	50,000	63,465	64,500	44,835	27,000	20,400	394,200	143,463
61	Capital invested in these enterprises to Dec. 31, 1919.....dollars	50,000	63,465	64,500	44,835	27,000	20,400	394,200	143,463
62	Additional capital required to complete these enterprises.....dollars	.....	.....	.....	.....	.....	.....	.....	.....
63	Average cost per acre when completed.....dollars	11.63	7.12	14.33	6.71	3.73	3.27	6.13	7.10
64	Enterprises constructing open ditches only.....dollars	.....	33,560	59,500	27,835	27,000	20,400	250,700	118,463
65	Average cost per acre when completed.....dollars	.....	6.98	13.84	4.38	3.73	3.27	5.02	6.61
66	Enterprises constructing open ditches and levees.....dollars	50,000	.....	.....	.....	.....	.....	148,500	25,000
67	Average cost per acre when completed.....dollars	11.63	.....	.....	.....	.....	.....	9.99	10.89
68	Enterprises constructing tile drains only.....dollars	.....	4,905	.....	.....	.....	.....	.....	.....
69	Average cost per acre when completed.....dollars	.....	17.52	.....	.....	.....	.....	.....	.....
70	Enterprises constructing open ditches and tile drains.....dollars	.....	25,000	5,000	17,000	.....	.....	.....	.....
71	Average cost per acre when completed.....dollars	.....	6.54	25.00	11.33	.....	.....	.....	.....
72	Enterprises constructing open ditches, tile drains, and levees.....dollars	.....	.....	.....	.....	.....	.....	.....	.....
73	Average cost per acre when completed.....dollars	.....	.....	.....	.....	.....	.....	.....	.....
CROPS.									
74	Improved land in enterprises reporting—	.....	.....	.....	.....	.....	.....	.....	.....
75	Hay as principal crop on drained land.....acres	430	.....	.....	311	456	.....	8,265	6,736
76	Corn as principal crop on drained land.....acres	.....	4,048	330	3,696	.....	2,828	.....	3,674
77	Small grains as principal crop on drained land.....acres	.....	.....	.....	750	.....	.....	5,026	.....
78	Vegetables as principal crop on drained land.....acres	.....	.....	.....	.....	.....	.....	.....	.....
79	Other crops as principal ones on drained land.....acres	.....	.....	.....	.....	.....	.....	5,620	.....
80	Not reporting principal crop on drained land.....acres	.....	.....	.....	.....	.....	.....	.....	.....

¹ Includes only Barron, Brown, Buffalo, Burnett, Calumet, Green, Green Lake, Manitowoc, Marinette, Polk, and Waupaca Counties.
² When works under construction have been completed. ³ Pumping plant located in Buffalo County. ⁴ Per cent not shown when more than 1,000

WYOMING.

The following pages present the statistics of drainage for Wyoming collected at the census of 1920. The figures relate to conditions on January 1, 1920, except where indicated otherwise. No census of drainage has been taken heretofore, so there are no comparable figures for previous years. The data relate to the artificial drainage of land in farms, and of other land that ultimately will be used for agricultural purposes. The organized drainage enterprises may include areas of unimproved land not yet in farms. The statistics

for drainage on farms were collected in the general census of agriculture, while the statistics for drainage enterprises were obtained in a special canvass of those enterprises. Since drainage on farms may be either inside or outside an organized enterprise, and the drains that each individual owner installs upon his own farm may be either supplemental to or entirely independent of the works installed by an enterprise, the figures for the two parts of the drainage census are presented separately.

TABLE 1.—SUMMARY FOR THE STATE: 1920.

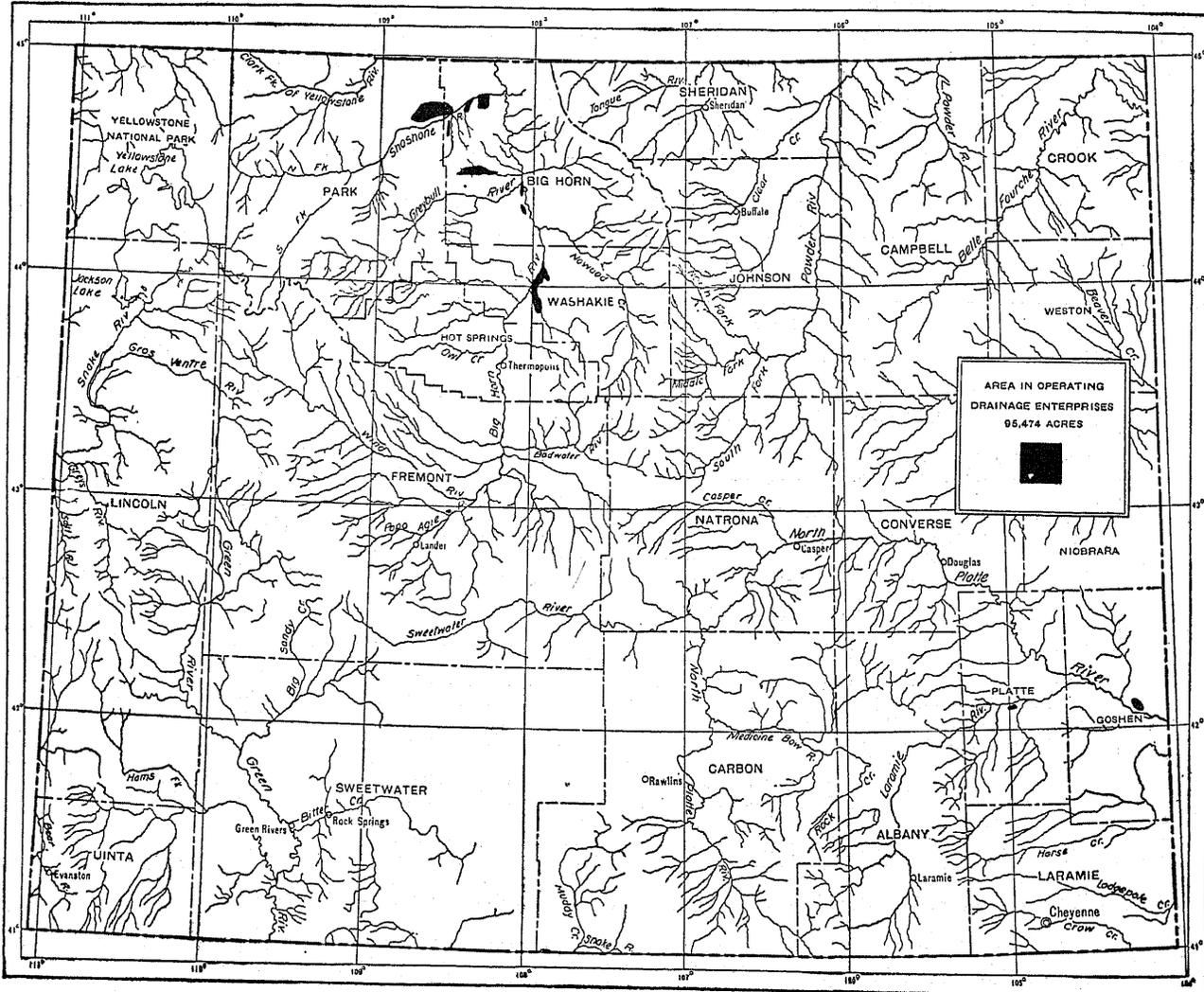
ITEM.	Amount.	Per cent of total.
DRAINAGE ON FARMS.		
Number of all farms in the state.....	15, 748	100. 0
Farms reporting land having drainage.....	433	2. 7
Farms reporting land needing drainage.....	1, 127	7. 2
All land in farms..... acres..	11, 809, 351	100. 0
Improved land in farms..... acres..	2, 102, 005	17. 8
Farm land reported as provided with drainage..... acres..	35, 654	0. 3
Farm land reported as needing drainage..... acres..	69, 066	0. 6
Needing drainage only..... acres..	23, 837	0. 2
Needing drainage and clearing..... acres..	45, 229	0. 4
DRAINAGE ENTERPRISES.		
Approximate land area of the state..... acres..	62, 430, 720	100. 0
All land in operating drainage enterprises..... acres..	95, 474	0. 2
Improved land..... acres..	84, 846	0. 1
Per cent of all improved land in farms.....	4. 0	.....
Unimproved land ¹ acres..	10, 628	(2)
Swampy, subject to overflow, seeped, or alkali..... acres..	20, 785	(2)
Suffering a loss of crops from defective drainage..... acres..	6, 595	(2)
Improved land prior to drainage..... acres..	83, 206	0. 1
Increase since drainage began..... acres..	1, 640	(2)
Land in nonoperating enterprises..... acres..	11, 567	(2)
Open ditches in operating enterprises..... miles..	26. 4	100. 0
Completed..... miles..	25. 1	95. 1
Additional under construction..... miles..	1. 3	4. 9
Tile drains in operating enterprises..... miles..	186. 0	100. 0
Completed..... miles..	114. 2	61. 4
Additional under construction..... miles..	71. 8	38. 6
Total capital invested in and required for completion of operating enterprises..	\$1, 667, 367	100. 0
Capital invested in these enterprises to Dec. 31, 1919.....	1, 175, 962	70. 5
Additional capital required to complete these enterprises.....	491, 405	29. 5
Average cost per acre when completed.....	17. 46	.....

¹ No timber or out-over land reported.

² Less than one-tenth of 1 per cent.

WYOMING

APPROXIMATE LOCATION AND AREA OF OPERATING DRAINAGE ENTERPRISES.



Operating and nonoperating enterprises.—In most of the tables that follow, statistics are given for operating enterprises only. These enterprises, as already defined, include both those which have completed their drainage works and those with such works under construction; among the latter may be some that had completed the original plan of reclamation several years ago but were constructing extensions or enlargements on January 1, 1920. The nonoperating enterprises have a legal existence, though they have not yet accomplished any drainage. They may include districts that on the census date had completed their plans, sold bonds to cover the cost of the undertakings, and let contracts for the construction work, and also districts that had just been established and were still subject to considerable change in area, plan of drainage works, and cost.

TABLE 2.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED AS BETWEEN OPERATING AND NONOPERATING ENTERPRISES: 1920.

CLASS.	LAND.		CAPITAL. ¹		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	107,041	100.0	\$1,182,362	100.0	\$901,873
Operating enterprises.....	95,474	89.2	1,175,962	99.5	491,405
With works completed.....	11,740	11.0	32,231	2.7	.....
With works under construction.	83,734	78.2	1,143,731	96.7	491,405
Nonoperating enterprises.....	11,567	10.8	6,400	0.5	410,468

¹ The inquiry asked for the "total cost of the enterprise to Dec. 31, 1919," and for an "estimate of additional investment to complete."

Location of enterprises.—Of the total area in operating drainage enterprises in Wyoming, 44 per cent is situated in Big Horn County, and nearly all is in the valley of Big Horn River in the north central part of the state. There are two enterprises in the eastern part, and a very small one in Fremont County.

TABLE 3.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY DRAINAGE BASIN: 1920.

DRAINAGE BASIN.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	107,041	100.0	\$1,182,362	100.0	\$901,873
Operating enterprises.....	95,474	89.2	1,175,962	99.5	491,405
Platte River.....	3,264	3.0	18,896	1.6	4,224
Big Horn River.....	92,210	86.1	1,157,066	97.9	487,181
Nonoperating enterprises.....	11,567	10.8	6,400	0.5	410,468
Big Horn River.....	11,567	10.8	6,400	0.5	410,468

Condition of land in enterprises.—All the drainage enterprises in this state are reported as organized for the purpose of draining or protecting land injured or threatened with water-logging or the concentration of salts, commonly called alkali, in the surface soil as a result of irrigation. For the state, 19,622 acres of land in drainage districts are reported as not having needed drainage, but as having been assessed merely for contributing to the injury of the other land.

The usual purpose of an organized enterprise is merely to provide adequate outlets into which the landowners of the district may drain their farms and to afford relief from overflows for the district as a unit. Therefore the fact that an enterprise which has completed the construction of the drainage works authorized contains land still swampy, subject to overflow, seeped, or alkali, or that suffers damage to crops, does not show that the improvement works are inadequate.

TABLE 4.—LAND IN ALL ENTERPRISES, CLASSIFIED BY CONDITION: 1920.

CONDITION OF LAND.	OPERATING ENTERPRISES.				Non-operating enterprises (acres).
	Total.		Works completed (acres).	Works under construction (acres).	
	Acreage.	Per cent of all land.			
All land in enterprises.....	95,474	100.0	11,740	83,734	11,567
Improved land.....	84,846	88.9	11,140	73,706	7,513
Unimproved land ¹	10,628	11.1	600	10,028	4,054
Swampy, seeped, or alkali.....	20,785	21.8	2,700	18,085	6,554
Suffering a loss of crops.....	6,595	6.9	2,165	4,430	1,000

¹ No timber or cut-over land reported.

Size of enterprises.—Presentation of the statistics by counties requires that an enterprise located in more than one county be divided, and the part in each county be considered a separate enterprise. In this way 15 operating drainage enterprises are counted in Wyoming, with an average area of 6,365 acres. There is no overlapping of the enterprises in this state.

TABLE 5.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY SIZE OF AREA ASSESSED: 1920.

SIZE GROUP.	Land in enterprises (acres).	ASSESSED AREA.	
		Acreage.	Per cent of total.
All operating enterprises.....	95,474	95,474	100.0
Less than 200 acres.....	140	140	0.1
200 to 499 acres.....	500	500	0.5
500 to 999 acres.....	21,514	21,514	22.5
1,000 to 4,999 acres.....	27,400	27,400	28.7
5,000 to 9,999 acres.....	45,920	45,920	48.1
10,000 to 49,999 acres.....	.....	.....	.....

Character of enterprises.—The drainage enterprises in Wyoming comprise drainage districts organized under the general drainage law approved March 1, 1911 (ch. 95), irrigation projects of the United States Reclamation Service, and two very small enterprises under the United States Indian Service and under individual ownership, respectively.

Drainage districts under the statute of 1911 are established by the district court of any county in which a part of the land to be affected is located. The district may comprise separated areas, if the court finds that drainage of all parts will be of public benefit and can be accomplished most economically as one undertaking. A petition for establishment must be signed by a majority of the owners representing at least one-third of the acreage, or by the owners of more than one-half the acreage in the proposed district. A preliminary investigation as to the practicability, public utility, probable benefits, and cost of the project is made by three commissioners appointed by the court. These commissioners become the executive officers of the district when it is established, to prepare the plan of improvement works, to assess damages and benefits to the property in the district, and to secure construction of the drainage works. The court holds public hearings to determine the sufficiency of the petition before appointing the commissioners, to discuss the preliminary report of the commissioners before establishing the district, and to consider objections to the commissioners' final report before approving the work and confirming the assessments of benefits and damages. Appeals regarding the assessments may be taken to the supreme court of the state. Bonds of the district may be issued by the commissioners.

TABLE 6.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

CHARACTER OF ENTERPRISE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All drainage enterprises.....	107,041	100.0	\$1,182,362	100.0	\$901,873
Operating enterprises.....	95,474	89.2	1,175,962	99.5	491,405
Drainage districts.....	60,834	56.8	638,682	54.0	491,405
U. S. Reclamation projects ¹	34,640	32.4	537,300	45.4	.....
Nonoperating enterprises.....	11,567	10.8	6,400	0.5	410,468
Drainage districts.....	11,567	10.8	6,400	0.5	410,468

¹ Includes 140 acres under U. S. Indian Service and 500 acres under individual ownership.

The United States Reclamation Service may provide drainage and protection for the land in its irrigation projects as it may deem necessary. An act of the legislature, February 27, 1919 (ch. 142), author-

izes cooperation between drainage and irrigation districts and the United States Reclamation Service in the construction of drainage and irrigation works.

An amendment to the drainage law, made March 5, 1915 (ch. 155), does not affect the character of those enterprises as described, and is the only other law of the state relating to drainage enterprises.

Drainage works.—The total works completed by drainage enterprises to December 31, 1919, comprised 25.1 miles of open ditches and 114.2 miles of tile drains; the additional lengths under construction were 1.3 miles of open ditches and 71.8 miles of tile drains. These figures do not include drains installed by individual farm owners supplemental to the works of the enterprises. There are no pumping districts for land drainage in the state.

TABLE 7.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY KIND OF DRAINAGE WORKS: 1920.

KIND OF WORKS.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All kinds.....	95,474	100.0	\$1,175,962	100.0	\$491,405
Open ditches only.....	3,404	3.6	25,127	2.1	4,224
Tile drains only.....	54,650	57.2	590,039	50.2	269,133
Open ditches and tile drains.....	37,420	39.2	560,796	47.7	218,048

The average depth of the main or outlet ditch was reported for each enterprise. The maximum reported for any enterprise in the state and the maximum in each county are shown in line 14 of County Table II. The maximum length, width, and depth of outlet shown in that table for any county may not refer to the same enterprise.

In County Table II, line 15 shows the mean depth of branch ditches (open ditches only), which is a very crude indication of the depth of soil drainage that may be obtained in the enterprises as determined by the depth of outlet provided for farm drains. The mean depth was computed by giving each separate depth a weight in proportion to the acreage it serves. As most enterprises reported depths in whole numbers only, the occasional decimals were omitted in making these computations.

TABLE 8.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY AVERAGE DEPTH OF BRANCH DITCHES: 1920.

DEPTH OF BRANCH DITCHES.	Acreage.	Per cent of total.
All operating enterprises.....	95,474	100.0
4.0 to 4.9 feet.....	500	0.5
8.0 to 8.9 feet.....	34,000	35.6
Not reporting branches.....	60,974	63.9

Maintenance of works.—The drainage law of 1911 provides for the maintenance of the drainage districts by the district commissioners, and authorizes assessments for such work to be levied against the land in the same proportion as the cost of original construction. It requires the commissioners to submit to the court each year a report stating the probable needs of the district for the next fiscal year, which is confirmed by the court at a hearing to determine objections.

TABLE 9.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY METHOD OF MAINTENANCE: 1920.

METHOD OF MAINTENANCE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional re-quired to complete.
			Amount.	Per cent of total.	
All operating enterprises.....	95,474	100.0	\$1,175,962	100.0	\$491,405
By district forces.....	45,390	47.5	697,300	59.3	259,775
By contract.....	8,400	8.8	8,000	0.7	.....
By method not specified.....	3,000	3.1	70,000	6.0	30,000
No maintenance provided.....	30,984	32.5	294,662	25.1	181,630
Not reported.....	7,700	8.1	106,000	9.0	20,000

Date of organization.—The progress in drainage development is shown only roughly by the dates of the organization of the enterprises, which are the dates when the districts were established by the district courts, since there may be a period of a year or more between the decree of establishment and the beginning of actual construction, and since the work of construction may occupy several years in a large district. It was not practicable, however, for the census to secure data as to the time of the beginning or the completion of the drainage works. Under the date of organization are tabulated the entire area, works, and capital of each enterprise, even including any extensions made after the original plan of drainage was completed.

TABLE 10.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	LAND.		AREA ASSESSED.	
	Acreage.	Per cent of total.	Acreage.	Per cent of total.
All operating enterprises.....	95,474	100.0	95,474	100.0
1910 to 1914.....	50,000	64.7	50,000	64.7
1915 to 1919.....	45,474	35.3	45,474	35.3

TABLE 11.—CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	CAPITAL.		
	To Dec. 31, 1919.		Additional required to complete.
	Amount.	Per cent of total.	
All operating enterprises.....	\$1,175,962	100.0	\$491,405
1910 to 1914.....	684,069	58.2	231,775
1915 to 1919.....	491,893	41.8	259,630

TABLE 12.—DRAINS (COMPLETED AND UNDER CONSTRUCTION) IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	DITCHES.		TILE.	
	Miles.	Per cent of total.	Miles.	Per cent of total.
All drains.....	26.4	100.0	186.0	100.0
1910 to 1914.....	20.0	75.8	105.0	56.5
1915 to 1919.....	6.4	24.2	81.0	43.5

Crops.—The principal crops grown upon the drained land in drainage enterprises are alfalfa and sugar beets. Data were not secured to show the part of each enterprise planted to any crop, so the enterprises have been classified according to the principal crop, and the total area of improved land is shown thus classified, in County Table II. No data were secured at the general census of agriculture to separate the crops grown upon land drained artificially from those produced upon land drained naturally.

COUNTY TABLE I.—DRAINAGE ON FARMS: 1920.

		THE STATE.	Big Horn.	Carbon.	Fremont.	Johnson.
1	Number of all farms in the state or county.....	15,748	998	413	969	624
2	Farms reporting land having drainage.....	433	108	7	20	8
3	Farms reporting land needing drainage.....	1,127	276	13	115	19
4	Farms in drainage and levee districts.....	337	129	.....	9	.....
LAND AND FARM AREA.						
5	Approximate land area of the state or county..... acres..	162,480,720	1,990,400	5,124,480	7,847,040	2,664,960
6	All land in farms..... acres..	11,809,351	190,445	843,520	449,331	472,611
7	Improved land in farms..... acres..	2,102,005	93,661	102,113	120,291	71,232
8	Woodland in farms..... acres..	421,806	7,830	14,566	8,750	5,163
9	Other unimproved land in farms..... acres..	9,285,540	88,954	726,841	320,290	396,216
10	Farm land reported as provided with drainage..... acres..	35,654	7,505	525	743	906
11	Farm land reported as needing drainage..... acres..	69,066	16,138	802	6,458	1,305
12	Drainage only..... acres..	23,837	10,992	377	3,295	765
13	Drainage and clearing..... acres..	45,229	5,146	425	3,163	550

¹ Includes 1,886,720 acres in Yellowstone National Park.

DRAINAGE—WYOMING.

COUNTY TABLE I.—DRAINAGE ON FARMS: 1920—Continued.

	Lincoln.	Park.	Platte.	Sheridan.	Washakie.	All other counties. ¹
1 Number of all farms in the county.....	923	839	1,146	972	318	8,546
2 Farms reporting land having drainage.....	8	204	10	18	34	16
3 Farms reporting land needing drainage.....	218	166	25	87	65	143
4 Farms in drainage and levee districts.....		161	5	2	29	2
LAND AND FARM AREA.						
5 Approximate land area of the county.....acres..	5,724,800	3,332,480	1,360,000	1,647,860	1,434,240	29,418,240
6 All land in farms.....acres..	441,212	286,193	974,429	625,796	93,379	7,432,435
7 Improved land in farms.....acres..	182,091	89,683	180,303	113,385	37,607	1,111,639
8 Woodland in farms.....acres..	10,025	7,613	60,577	8,741	3,354	295,187
9 Other unimproved land in farms.....acres..	249,096	188,897	733,549	503,670	52,418	6,025,609
10 Farm land reported as provided with drainage.....acres..	917	16,155	2,288	763	4,818	1,034
11 Farm land reported as needing drainage.....acres..	16,793	2,678	798	2,165	2,919	19,010
12 Drainage only.....acres..	993	2,534	682	591	1,621	1,992
13 Drainage and clearing.....acres..	15,795	144	116	1,574	1,298	17,018

¹ No drainage on farms reported in Campbell, Converse, Crook, Hot Springs, Natrona, Niobrara, and Weston Counties.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920.

	THE STATE.	Big Horn.	Park.	Washakie.	Other counties. ¹
LAND AREA.					
1 Approximate land area of the state or county.....acres..	62,430,720	1,990,400	3,332,480	1,434,240	10,606,080
2 All land in operating drainage enterprises.....acres..	95,474	41,750	29,920	20,400	3,404
3 Improved land.....acres..	84,846	33,922	29,920	17,600	3,404
4 Per cent of all improved land in farms.....	4.0	36.2	33.4	46.8	0.7
5 Unimproved land.....acres..	10,628	7,828		2,800	
6 Swampy, seeped, or alkali, in enterprises.....acres..	20,785	18,787	598	1,400	
7 Suffering a loss of crops from defective drainage.....acres..	6,595	4,357	598	1,500	140
8 Assessed acreage.....acres..	95,474	41,750	29,920	20,400	3,404
9 Excess over all land in operating enterprises.....acres..					
DRAINAGE WORKS.					
10 Open ditches:					
11 Completed.....miles..	25.1	2.5	17.6		5.0
12 Additional under construction.....miles..	1.3	0.8			0.5
13 Maximum completed in any enterprise.....miles..	17.6	2.4	17.6		3.0
14 Maximum width at bottom of ditch.....feet..	6	4	4		6
15 Maximum of average depths of outlet ditches.....feet..	12.0	8.5	8.5		12.0
16 Mean depth of branch ditches.....feet..	7.9	8.0	8.0		4.0
17 Tile drains:					
18 Completed.....miles..	114.2	43.9	47.1	23.2	
19 Additional under construction.....miles..	71.8	32.9	27.7	11.2	
20 Maximum completed in any enterprise.....miles..	47.1	16.0	47.1	16.0	
21 Maximum size of tile.....inches..	24	24	18	18	
22 Area drained by open ditches only.....acres..	3,404				3,404
23 Length of these ditches.....miles..	5.5				5.5
24 Average length per acre.....feet..	8.5				8.5
25 Area drained by tile only.....acres..	54,650	34,250		20,400	
26 Length of these tile.....miles..	93.1	58.7		34.4	
27 Average length per acre.....feet..	9.0	9.0		8.9	
28 Area drained by open ditches and tile.....acres..	37,420	7,500	29,920		
29 Length of these drains.....miles..	113.8	21.4	92.4		
30 Average length per acre.....feet..	16.1	15.1	16.3		
DEVELOPMENT OF LAND.					
31 Improved land in operating enterprises, 1920.....acres..	84,846	33,922	29,920	17,600	3,404
32 Improved land prior to drainage.....acres..	83,206	33,922	29,920	16,100	3,264
33 Increase since drainage.....acres..	1,640			1,500	140
34 Per cent of increase.....	2.0			9.3	4.3
35 Per cent increase is of all improved land in farms, 1920.....	0.1			4.0	(²)
36 Unimproved land, 1920.....acres..	10,628	7,828		2,800	
37 Unimproved land prior to drainage.....acres..	12,268	7,828		4,300	140
38 Decrease since drainage.....acres..	1,640			1,500	140
39 Per cent of decrease.....	13.4			34.9	100.0
40 Swampy, seeped, or alkali, 1920.....acres..	20,785	18,787	598	1,400	
41 Swampy, seeped, or alkali prior to drainage.....acres..	71,809	27,185	29,920	11,300	3,404
42 Decrease since drainage.....acres..	51,024	8,398	29,322	9,900	3,404
43 Per cent of decrease.....	71.1	30.9	98.0	87.6	100.0
CAPITAL INVESTED AND COST PER ACRE.					
44 Total capital invested in and required for completion of operating enterprises.....dollars..	1,667,367	727,433	632,583	278,000	29,351
45 Capital invested in these enterprises to Dec. 31, 1919.....dollars..	1,175,962	550,027	442,808	158,000	25,127
46 Additional capital required to complete these enterprises.....dollars..	491,405	177,406	189,775	120,000	4,224
47 Average cost per acre when completed.....dollars..	17.46	17.42	21.14	13.63	8.62
48 Enterprises constructing open ditches only.....dollars..	29,351				29,351
49 Average cost per acre when completed.....dollars..	8.62				8.62
50 Enterprises constructing open ditches and tile drains.....dollars..	778,844	146,261	632,583		
51 Average cost per acre when completed.....dollars..	20.81	19.50	21.14		
52 Enterprises constructing tile drains only.....dollars..	859,172	581,172		278,000	
53 Average cost per acre when completed.....dollars..	15.72	16.97		13.63	
CROPS.					
54 Improved land in enterprises reporting—					
55 Alfalfa as principal crop on drained land.....acres..	54,364	4,080	29,920	17,600	2,764
56 Sugar beets as principal crop on drained land.....acres..	15,742	15,742			
57 Hay (except alfalfa) as principal crop on drained land.....acres..	2,600	2,100			500
58 Not reporting principal crop on drained land.....acres..	12,140	12,000			140

¹ Includes only Fremont, Goshen, and Platte Counties.
² Includes 1,886,720 acres in Yellowstone National Park.
³ No timber or out-over land reported.

⁴ When works under construction have been completed.
⁵ Less than one-tenth of 1 per cent.